

**THE MANAGEMENT OF
CHILDHOOD ASTHMA**

THE MANAGEMENT OF CHILDHOOD ASTHMA

by

FREDERIC SPEER M.D.

*Assistant Clinical Professor of Pediatrics
The University of Kansas School of Medicine
Director of Pediatric Agency Clinic
The University of Kansas Medical Center and
Director of Agency Clinic
Children's Mercy Hospital
Attending Pediatrician, Bethany Hospital
Poudre Hospital and St. Margaret Hospital
Kansas City
Fellow of the American Academy of Pediatrics
Fellow of the American College of Allergists*



CHARLES C. THOMAS • PUBLISHER

Springfield • Illinois • U.S.A.

CHARLES C THOMAS • PUBLISHER
BANNERSTONE HOUSE
301 327 East Lawrence Avenue, Springfield, Illinois U S A

Published simultaneously in the British Commonwealth of Nations by
BLACKWELL SCIENTIFIC PUBLICATIONS, LTD, OXFORD ENGLAND

Published simultaneously in Canada by
THE RYERSON PRESS, TORONTO

This book is protected by copyright. No part
of it may be reproduced in any manner with-
out written permission from the publisher.

Copyright 1958 by CHARLES C THOMAS • PUBLISHER

Library of Congress Catalog Card Number 58 8434

*Printed in Cape Girardeau, Mo.,
in the United States of America*

PREFACE

What is childhood asthma? Is it a mysterious syndrome for which there is little hope and no specific treatment? Is it a more or less harmless childhood problem which will eventually be outgrown? Is it some sort of neurosis with roots in the mother's emotional life? In spite of the fact that allergic management of asthma has proved uniformly effective questions like these continue to be asked or implied

In Burton's *The Anatomy of Melancholy* is found this abbreviated account of a Sixteenth Century consultation. In Reimerus Solenander's counsels he and Dr Brance both agreed that the patient's disease was hypochondriacal melancholy. Dr Matholdus said it was *asthma* and nothing else. Taking his cue from the forthright dissenting consultant the allergist of today might add: And it is an allergic disease and nothing else!

With an increasing number of physicians becoming interested in the allergic approach to childhood asthma a need has arisen for a text which would include the methods essential to the proper establishment of allergic control. It is to meet this need that this manual has been prepared. Neither this book nor any other can hope to give all the information that every physician will require in every case but if with its use the reader can develop a sound basis for an attack against the disease it will have fulfilled the purpose for which it was written.

FREDERIC SPFFER M.D.

ACKNOWLEDGMENTS

Since this manual is the outgrowth of the teaching program of the pediatric services of the University of Kansas and The Children's Mercy Hospital, the writer would like to acknowledge the cooperation of the three who made the establishment of the pediatric allergy clinics possible Dr Herbert C Miller, Chief of Pediatrics, Dr Orval R Withers, Chief of Allergy, and Miss Elizabeth Martin, R N , former superintendent of Mercy

For suggestions and assistance in the preparation of the manuscript, thanks are due Dr Alex Roth, Dr Thorvald Jensen, Dr Antoni Diehl, Mr William M McGrew, B S Chief of the Photography Service, and Mrs Jo Ann Clifford medical artist

For giving the benefit of her professional experience as a writer to a review of the manuscript, thanks are due my mother, Mrs Clara Aiken Speer For her aid in preparing the section on Allergic Cookery and for her patience during the preparation of the book, special thanks are due my wife, Mrs Jeannette Hybskmann Speer

F S

CONTENTS

	<i>Page</i>
<i>Preface</i>	v
<i>Acknowledgments</i>	vii
<i>Chapter</i>	
1 The Asthmatic Child and His Family	3
Asthma and the Child	3
The Family	4
The parents' feelings	4
Parent education	5
2 The Diagnosis of Asthma	7
The Clinical Picture	7
Modes of onset	8
Systemic Allergy	11
Nasal allergy	12
Examining the nose	12
The nasal smear	13
The skin	13
The nervous system	14
The gastrointestinal system	14
The genitourinary system	15
Miscellaneous systemic manifestations	16
Differential Diagnosis	17
	18

<i>Chapter</i>	<i>Page</i>
3 Etiology of Asthma: Inhalants	21
Pollens	21
Composite	21
Grasses	23
Chenopods (goosefoot family)	25
Amaranthis (pigweeds)	26
Trees	26
Other plants	26
Which pollens are important	27
Mold Allergens	28
Important molds	28
Other molds	29
Atmospheric Studies	30
Materials	30
Counting technique	32
Nonseasonal Inhalants	36
House dust	36
Animal epithelials	39
Miscellaneous inhalants	40
Less common inhalants	41
4 Etiology of Asthma: Foods, Drugs, Insect Bites, Non-specific Factors	42
Food Allergens	42
Which foods are important?	42
The biological relationship of foods	43
Food families	43
Animal kingdom	44
Foods without relatives	45
Mineral kingdom	45

<i>Chapter</i>	<i>Page</i>
Sources of foods	46
Drug Allergens	46
Allergy to Insect Bites	48
Nonspecific Causes	49
Infection	49
Primary inhalant irritants	49
Physical factors	51
Psychic factors	52
5 Finding the Causes of Asthma	53
History Taking in Asthma	53
The history form	55
Skin Testing	55
Intracutaneous test	58
Scratch test	58
Significance of skin reactions	61
The Clinical Testing of Foods	62
When to test foods	62
Selection of foods for testing	62
Technique of clinical food testing	63
Case Study	65
Working Out the Cause of Asthma in Infancy	71
Case Study Infantile Asthma	71
6 Treatment of the Asthmatic Attack	75
General Management	75
Drugs	76
Epinephrine	76
Aminophylline	77
Other drugs	77
Dehydration	78

<i>Chapter</i>	<i>Page</i>
Infection	79
Status Asthmaticus	79
What Not to do in Asthmatic Attacks	80
7 Specific Treatment	82
Avoidance of Inhalants	82
Avoidance of Food Allergens	83
Hyposensitization	85
Preparation of treatment set	86
Hyposensitization schedule	89
Precautions in hyposensitization	89
Treatment of reactions	91
How long is hyposensitization continued?	92
8 Management of Problem Cases	93
Failure in family cooperation	93
Incomplete avoidance	94
Slow response to hyposensitization	94
New sensitivities	95
Psychic factors	95
Hidden food allergens	96
9 Allergic Cookery	99
Milk Free Diets	99
Egg Free Diets	100
Corn Free Diets	102
Wheat Free Diets	102
Tomato Free Diets	103
Citrus Free Diets	103
Food Dye Free Diets	103
Meat Free Diets	104
References	105
Index	113

**THE MANAGEMENT OF
CHILDHOOD ASTHMA**

It is one of the wonders of pediatric allergy practice that the mother of the asthmatic child is typically patient, devoted, observant, and wise. To this typical mother this book is dedicated.

*She openeth her mouth with wisdom,
and in her tongue is the law of kindness—
—Proverbs XXXI 26*

The asthma doctor must and dare not forget that his own quiet, deliberate and reassuring manner and his absolute conviction that almost all cases of asthma can be cured, constitute one of the most important prerequisites for success.

—URBACH¹ 28

Chapter 1

THE ASTHMATIC CHILD AND HIS FAMILY

ASTHMA AND THE CHILD

No matter how poor a medical term may be, once it becomes attached to a disease entity it is not likely to be replaced. This is true of malaria and angina pectoris, and it is true of asthma. An attempt to improve the term and differentiate it from cardiac dyspnea has been made by speaking of bronchial asthma but this is of little help as all asthma is bronchial. It might better be called *bronchial allergy* or allergic bronchitis but these terms have little backing and no official sanction.

Asthma may be defined as an allergic disease of the bronchioles and small bronchi characterized by edema of the mucosa, muscle spasm, and hypersecretion of mucus. The outstanding clinical manifestations are dyspnea, wheezing and cough. These phenomena occur in attacks, separated by intervals of more or less relief. Although spontaneous remission is not unknown in asthma it is essentially a chronic disease which if untreated usually leads to progressive loss of vital capacity and emphysema. It is a common disease of childhood and is found at all ages.

Asthma seldom if ever occurs as an isolated allergic manifestation. The patient is allergically speaking 'sick all over' asthma representing only one of many allergic manifestations. For uniformly successful results in this

disease the physician must identify *all* allergic manifestations and *all* responsible allergens

The young child does not seem unduly disturbed by his asthma. He is aware of his heaving chest and can hear his wheezing, but it does not seem to occur to him that everyone is not affected in the same way. As he grows older he begins to see that he is different, that he is under certain restrictions, and receives special consideration from others. With this new awareness comes the urge to get well. It is a source of continual surprise to allergists to note how early in life their little patients accept the restrictions and discomfort of allergic management. In watching their diets they are often more alert than their mothers, and where hyposensitization is given, they accept their 'shots' with remarkable cheerfulness and fortitude.

THE FAMILY

A surgeon repairing a hernia does not invite the family in to assist him. A physician dealing with an asthmatic child, however, must do just that, and his success depends very much on his ability to gain the confidence of the parents and enlist their cooperation. To gain their confidence he must understand how they feel about their child, and to enlist their cooperation he must educate them in the fundamentals of allergy and asthma.

The Parents' Feelings

The most significant reaction of parents on becoming aware that their child has asthma is fear. They have probably known of asthma among their acquaintances and they think at once of the most serious case in their experience. The 'asthma' they have known may well have been any one of a number of other chest diseases, but the word still strikes fear to the heart and often leads

to dismay and panic. With the passage of time the attacks are inclined to become increasingly severe and the desire to escape from so frightening a situation is often overpowering leading to the urge to flee to some supposedly ideal climate. Such flight not infrequently takes place often at the price of family disruption and financial ruin.

The child then is often the center of a taut emotional situation and no matter how calm the surface it is well to proceed on the assumption that all is not well within. The mother is certain to have had extensive and gratuitous advice from all sorts and conditions of people and has almost certainly been assured by someone that the whole problem stems from the fact that her child is unwanted and rejected. In her unhappy and bewildered condition she may half way accept this cruel judgment and with her original problem complicated by guilt and frustration her misery may have been heightened to an almost unbearable extent.

If the physician sees that he is dealing with a family whose integrity is threatened by the emotional byproducts of asthma he has an opportunity to do much to restore it. When the parents learn that he is fully aware of their feelings and looks upon them with sympathy and understanding the way is clear for their self confidence and poise to return. If he then proceeds to embark on a tireless campaign against the child's disease even though progress be slow and uneven he can look for patience and trust in his relations with the family.

Parent Education

The allergist works mainly with the mother of the asthmatic child and he should teach her all she is capable of learning about allergy and asthma withholding nothing that will make for better management of the disease.

She should know something of

- (1) The theory of allergy
- (2) The nature of asthma
- (3) The common causes of asthma
- (4) How the causes are detected
- (5) The limitations of skin testing
- (6) What to do in case of an attack
- (7) How long it will probably take to achieve control
- (8) Special factors applicable to her child

Much of this information she can pass on to her husband and all of it to her growing child. No fear need be felt that the mother will go off on her own in treatment. Some women do this anyway and the better she understands allergy and asthma the less tempted she will be to experiment with irrational methods.

An excellent booklet for family education *Allergy in Children* is now available through the American Foundation for Allergic Diseases, Inc. 271 Madison Avenue New York 16 New York.

Chapter 2

THE DIAGNOSIS OF ASTHMA

It is impossible to exaggerate the importance of careful diagnosis in the child with dyspnea, wheezing, or cough. It is the responsibility of the allergist to determine if each case is *really* asthma and *only* asthma. The three essentials in diagnosis are

- (1) The presence of the typical clinical picture
- (2) The presence of associated allergic traits
- (3) Differential diagnosis

THE CLINICAL PICTURE

An attack of asthma characteristically begins with sneezing, nasal discharge and a dry cough. As the attack develops the cough becomes steadily more severe and frequent, and wheezing and dyspnea rapidly set in. It is soon apparent that the distress of the child is great. This is reflected in his anxious expression, labored breathing and pale clammy skin. In severe attacks the lips may be cyanotic, especially in young children, and further evidence of oxygen want may include restlessness, irritability and even delirium. The patient's efforts are soon concentrated on breathing, and thus, with his frequent inability to take fluids, leads to progressive weakness and dehydration. Vomiting is common and may, as Ratner²⁰ has pointed out, bring a measure of relief. If it is prolonged, however, it further interferes with respiration and greatly aggravates dehydration and fatigue.

Examination of the chest at the height of the attack reveals evidence of more or less emphysema, with the chest distended and the amplitude of respiratory movements lessened. The percussion note is tympanitic, and cardiac dulness is obscured. Most obvious of all are the classic asthmatic rales. These are best described as squeaks, and occurring as they do over wide areas of the chest and with variations in pitch might be compared to the squeaking of a chorus of mice.

In prolonged attacks these rales may become coarse, but it should be emphasized that the true asthmatic rale is always expiratory. It is true that moist inspiratory rales may occur in asthma, but their presence usually indicates infection, atelectasis, or bronchiectasis.

Between attacks the child may present no chest findings, but in severe cases, more or less wheezing may usually be found at almost any time. If it is not heard during ordinary breathing it may be brought out by the method of "Lineman." The examiner holds one hand on the front of the chest, the other on the back. The stethoscope is held between the thumb and palm of one hand and during expiration the examiner's hands are pressed firmly together so as to empty the chest of air. In this way, wheezing can often be produced when it is otherwise absent.

In an occasional case there will be evidence of deformity of the chest. In children around the age of 2 years, the sternum is often depressed, while in older children, changes resembling the pigeon breast of rickets are seen (Fig. 1). Although less common, the typical barrel chest of chronic emphysema may be found.

Modes of Onset

Of fundamental importance in the management of asthma is an understanding of the various ways an attack



Figure 1 Changes in Rib Cage in Childhood Asthma (a) Early changes in six year old boy Note slight prominence of sternum and upper costal cartilages (b) Advanced changes in nine year old boy Note marked forward thrust of sternum flaring of ribs and Harrison's groove Picture taken during inspiration so as to accentuate these findings

may be initiated. Below are listed five distinct mechanisms. More than one may be operative in any case and there may be mixing of types but if the patient is carefully followed his particular way of reacting will eventually become apparent.

(1) *Simple Exposure* In cases of marked sensitivity exposure to the allergen is sufficient to bring on an attack. Familiar examples are patients sensitive to animal

epithelials or to such ingestants as aspirin or shrimp. If there is no other sensitivity the patient is entirely symptom free between attacks. If simple exposure were the only mechanism or even the usual mechanism in allergy the management of asthma would be far simpler than it is.

(2) *Exceeded Tolerance* Many if not most asthmatic children have some degree of tolerance to allergens to which they are sensitive and develop a frank attack only when this tolerance is exceeded. A child sensitive to house dust for example may have an attack only when helping with house cleaning and another sensitive to chocolate may flare up only when as his mother says "He makes a pig of himself." Many of these patients have some evidence of asthma between attacks.

(3) *Triggered Attacks* Allergic children especially young children often show little if any evidence of asthma until their allergic balance is upset by a trigger mechanism. The most important of these is respiratory infection²¹ and mothers commonly feel that their children are allergic to colds. Asthma attacks are especially likely to appear during the incubation period of measles and certain other infectious diseases.²²

Also of importance as a trigger mechanism is thermal change especially chilling and this at least partially accounts for the fact that some children are upset by sudden weather changes. It should be remembered however that the chief cause of weather change is wind and wind often brings high mold and pollen counts.

(4) *Allergens Acting Together* Certain allergens are relatively or entirely harmless when acting alone but may initiate attacks when acting synergistically with an other such allergen. This phenomenon is found commonly in asthma of combined food and inhalant origin. An example is the patient who tolerates oranges at any time

except the ragweed season or to put it another way tolerates ragweed quite well except when he eats oranges

It is important that allergens of this type be identified as failure to do so is an important source of failure in the treatment of inhalant allergy. Parents of children being given pollen or mold hyposensitization should be advised that failure in such treatment may call for investigation of foods as synergistic allergens.

(5) *Cyclic Asthma* Asthma at times shows a tendency to occur in cycles with no apparent initiating factor. In some cases the periodicity of attacks is remarkably constant and mothers can predict almost to the day when an attack will occur. This type is most commonly found in young children with food allergy. There is a seasonal factor in many cases as attacks often do not occur in hot weather. It is interesting to note that this tendency for the manifestations of food allergy to appear in cycles and be worse in winter has been reported in the Northern Hemisphere by Rowe and in the Southern Hemisphere by Briedahl.⁹

SYSTEMIC ALLERGY

Essential to a proper understanding of childhood asthma is an awareness that these children are highly allergic individuals who commonly present widespread evidence of systemic allergy. When confronted with a multitude of these complaints related by an anxious mother the physician may be tempted into the old concept of the neurotic origin of asthma but if he proceeds to deal with them as bona fide somatic disorders he will find that they will help him establish the allergic nature of suspected asthma and help him find the cause. If he then proceeds to relieve them he will find that he has relieved a constitutional allergic problem which represents far more

than a simple bronchial disorder

Nasal Allergy

A common but not invariable accompaniment of asthma is nasal allergy. Parents of asthmatic children often show surprisingly little interest in this problem, so great is their anxiety over asthma. It is often the duty of the allergist to point out that nasal allergy is a first rate problem in its own right.

As in asthma, the outstanding findings in allergy of the nose are mucosal edema, hypersecretion, and obstruction of the airway. Itching and sneezing in nasal allergy are analogous to the wheezing and cough of bronchial allergy. The symptoms vary considerably from patient to patient in degree and severity. Frequent colds are a common complaint, and although many of these are allergic flares others are indeed infections.

Examining the Nose

The physician treating allergic children should form the habit of looking in the nose of every respiratory case at every visit until the case is controlled. Whatever skilled examinations belong exclusively to the rhinolaryngologist, the use of a head mirror and a nasal speculum should be familiar to all. In nasal allergy the chief finding is edema. The inferior turbinates are commonly tremendously swollen and may be the only structures seen. Their color is usually bluish gray, and an excess of clear or opaque mucus is a regular finding. There are often large crusts of dry mucus. The writer has formed the habit of making a diagrammatic sketch of the degree of swelling of the inferior turbinates on the child's chart at each visit. These sketches become useful in charting the progress of the case.

asthma, but not uncommonly the two diseases occur at the same time. In infants, the face, especially the cheeks, is most likely to be involved, but in severe cases, virtually the entire body may be affected. In older children, the sites of predilection are the skin folds of the extremities but patchy involvement of the face, neck, and trunk are common. It is not at all unusual for eczema and asthma to be on the same etiologic basis.

Urticaria and Angioedema If the patient is sensitive to a substance which causes urticaria or angioedema and develops asthma from the same cause the asthma is likely to be very severe. One gets the impression in these cases that the child develops 'urticaria of the bronchus' rather than ordinary asthma.

The Nervous System

Tension Fatigue A behavior pattern marked by extremes of mental and physical activity is commonly found in asthmatic children.²⁰ As infants they are overactive, tense and sleepless. In older childhood, tension takes the form of irritability and such patients are inclined to act "spoiled," to be quarrelsome, peevish and resentful. Also with increase in age the tense behavior is accompanied by periods of listlessness, achiness and fatigue. It is most gratifying to find that this type of behavior tends to disappear as the allergic problems of the child are solved.

Migraine It often comes as a surprise to those not acquainted with childhood ills to find that children not uncommonly suffer from migraine. In discussing the problem with adult sufferers, one often learns that they have had "sick headaches" as long as they can remember. There have been numerous reports²¹ as to the allergic origin of this syndrome in children and the impression is growing that allergy is the outstanding cause. Since young

children cannot easily express themselves it often is revealing to ask the child with cyclic vomiting if he hurts anywhere. Many times the child will reply that his head hurts!

Convulsions When anaphylaxis and allergy were new there was high hope that epilepsy would be found to be a disease of hypersensitivity. This has not come to pass but at times convulsions will be found to be of allergic origin. The author has three asthmatic children under his care who have had generalized convulsions. All are extremely allergic children and in two cases foods have been shown to be the source of the convulsions. Chocolate is the cause in one egg in the other.

The Gastrointestinal System

Foods which cause asthma often cause gastrointestinal disturbances as well. Where such complaints appear without other cause they are to be considered of possible allergic origin and their source carefully sought.

Diarrhea No bowel complaint is more likely to be of allergic origin than recurrent diarrhea. Allergic diarrhea often begins in early childhood and many times the history will implicate the offending foods. When the mother reports that a particular food caused diarrhea in infancy but the child has outgrown it this food should be considered very seriously as a possible cause of other allergic complaints including asthma.

Abdominal Pain Any ailing child may complain of stomach ache much as an adult may complain of head ache and does so almost as commonly. Where there is persistent discomfort the trouble may often be traced to a food.

Constipation The common expressions "Boiled milk is constipating" and "That makes the cheese more

binding,' give a clue to a food which is a common cause of constipation. It may be argued that the nature of the curd of cow's milk rather than allergy to this food causes constipation, and that may be true, but it is not an uncommon occurrence to find other foods responsible for the production of hard stools. Flatulence is a common accompaniment of allergic constipation and other intestinal allergies.

Foul Breath. A common finding in childhood allergy is foul breath. In some cases this seems to depend on poor nasal function, but in others, it seems to be a direct result of food allergy. It commonly causes great concern to parents and it should be marked as a symptom to watch during the course of management of the more serious allergic manifestations. It is at least partly because of this finding that anorexia is so common in allergic children.

Other Gastrointestinal Manifestations. Occasional findings in allergic children are vomiting, bloating, geographical tongue, and aphthae or canker sores. Vomiting is confined largely to infants; the older child usually either 'outgrows' this manifestation or learns to avoid the offending agent. Bloating is often mistaken for obesity but when the waistline rapidly diminishes during food elimination it is often found that relief of distension is the correct explanation. Geographical tongue, like other disturbances of the digestive tract, often disappears during the course of allergy treatment. Canker sores often are caused by foods, toothpaste, or other substances taken into the mouth.

The Genitourinary System

Although genitourinary allergy is not of outstanding importance, there are several annoying symptoms worthy of note. Many allergic girls are given to vulva irritation

and pruritis. Frequency of urination is a common complaint and enuresis may be present as well. Probably most enuresis in allergic children has nothing to do with allergy but the possibility that it is due to allergic bladder irritation is to be considered. Foods which are most commonly found responsible for enuresis are citrus fruits, tomato, milk, food dyes and black pepper.

Miscellaneous Systemic Manifestations

The Blood As is well known, eosinophilia is very common in allergic individuals. According to Rinkel, Randolph and Zeller¹⁰ the leucocyte level in patients with food allergies is inclined to be labile and chronic leucopenia is common. Anemia does not seem to be a symptom directly attributable to allergy.

Hyperhidrosis Bowen has spoken of certain asthmatic children as "wet sleepers." When mothers become aware of the fact that hyperhidrosis can be a specific allergic reaction to foods, they will often note that the eating of a certain food will invariably be followed by heavy sweats.

Muscle Pains Pains in the large muscles, especially those of the thigh and leg, are common in allergic children. The pain is characteristically worse at night and may be rather severe.

Allergic Facies Where constitutional allergy is widespread, poor color is common. Patients often appear pale and listless with infraorbital discoloration and puffiness.

Fever Although drug fever is fairly well known, it is often overlooked that other allergens may produce acute or chronic fever.¹¹ Acute fever is most common in infants and may be as high as 106° F. or more. The allergist sees several patients each year with fever due to a

lergy to foods

DIFFERENTIAL DIAGNOSIS

It is surprising how closely a number of other diseases may resemble asthma and it is the duty of the physician to rule out all conditions capable of producing a similar clinical syndrome. He must be especially on his guard if the child has a history of asthma.

In this section the most common conditions which may be confused with asthma will be discussed.

(1) *Foreign Body in the Bronchus* This accident is a leading source of confusion in the diagnosis of asthma,* and because of its peculiar dangers deserves first consideration. A history of choking on a particle of food or other object is often obtained, and there may have been subsequent coughing, difficult breathing and perhaps cyanosis. Localized, unilateral expiratory wheezing is often heard and associated atelectasis or emphysema may be identified by physical examination and roentgenogram. The latter may show an opaque foreign body.

(2) *Bronchiolitis* An infectious process much like asthma and variously termed bronchiolitis, spasmodic bronchitis, asthmatic bronchitis, or capillary bronchitis occurs not uncommonly in infants. It may, at least in some cases, represent the asthmatic response to infection and the possibility of later asthma should be kept in mind. It is characterized by dyspnea, wheezing, cough, fever, and prostration. As in asthma the wheezing is generalized, but it is usually much louder and coarser than that of asthma. In infants, bronchiolitis is undoubtedly the disease most frequently confused with asthma, and in many cases a definite diagnosis must be deferred.

(3) *Pneumonia* A coarse type of expiratory wheezing is sometimes found in bronchopneumonia, and,

especially if there is a previous history of asthma confusion may arise. A useful early sign commonly appearing before the typical physical and roentgenological signs become manifest is flaring of the nostrils on inspiration. If there is any doubt as to the presence of pneumonia it is an excellent plan to initiate pneumonia therapy.

(4) *Bronchiectasis*: Generally speaking the asthmatic wheezes while the bronchiectatic rattles but Field¹⁰ reported wheezing in 33 per cent of a series of cases of bronchiectasis. Where there is real doubt a bronchiogram may be indicated.

(5) *Croup*: In infants it is not always easy to differentiate croup from asthma. In both conditions respiration is labored but in croup the loud hoarse breathing will usually betray its laryngeal origin. Where a child's airway threatens to become dangerously narrowed whatever the suspected cause no time should be lost in consulting a laryngologist.

(6) *Fibrocystic Disease of the Pancreas*: The infant with severe food allergies and the infant with fibrocystic disease of the pancreas may act very much alike both being given to digestive and bronchial difficulties.

(7) *Congenital Laryngeal Stridor*: This condition is ordinarily detected easily but when accompanied by nasal allergy it may produce a picture not unlike asthma.

(8) *Congenital Heart Disease*: Frequent attacks of bronchial infection with cough are seen in certain cases of congenital heart disease in which there is increased pulmonary flow. Where a murmur is not obvious as in occasional cases of atrial septal defect these recurrent episodes may suggest asthma.

(9) *Thymic Asthma*: Although the thymus gland is currently considered of little if any importance in obstruction of the airway Glaser¹¹ warns. It is desirable to keep

27. *Obstruction of the larynx* is possible disorders of a g and a h. The following are the signs:

10. *Stridor* *Diagnosis* A functional type of stridor is found in susceptible children who have some degree of laryngeal obstruction. It should be distinguished from the cases where the child may be reacting to some form of infection that precedes more serious stridor.

11. *Nasal obstruction* In infants, nasal obstruction may occur. In infants, the tongue is relatively large and is held close to the palate and when the nose is not unobstructed, the child makes a peculiar noise. The respiratory system may be confused with the symptoms of stridor.

Less likely possibilities in differential diagnosis are peracute infectious laryngitis and croup. The latter is characterized by a croupy cough, stridor, and fever. The similarity of the two has caused more confusion than a similarity of symptoms. If it occurs in children it does so under conditions which would not lead the physician to confuse it with stridor.

Chapter 3

ETIOLOGY OF ASTHMA: INHALANTS

Most substances finely enough divided to be carried in the air may act as inhalant allergens. These may appear seasonally as is strikingly true of pollens and largely true of mold spores. Others may be encountered at any time, and in this category are found animal epithelium, house dust, insecticides, and other household inhalants. In adults there is scarcely any limit to the possibilities in this type of allergen, but children as a rule are exposed to relatively few inhalant contacts. The inhalants commonly encountered in childhood practice are molds, pollens and house dust, and the relative importance of each is indicated in Figure 2 and Table 1.

POLLENS

Any plant which is wind pollinated (as opposed to insect pollinated) is a potential source of respiratory allergy. In practice, however, only those pollens which combine the following characteristics will be found important.¹⁰

(1) *Buoyancy* Corn pollen, for example, is of little clinical importance because it is so heavy that it does not travel over 200 feet from its source.¹¹

(2) *Antigenicity (Toxicity)* Pine is a heavy producer of buoyant pollen, but is apparently incapable of sensitizing.

(3) *Productivity* Although crabgrass pollen is pre-

sumably buoyant and toxic, it is released into the air in such scanty quantity that it is of no importance in allergy

This section will be devoted to a discussion of pollens

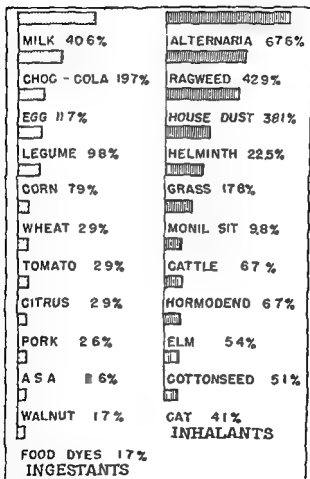


Figure 2 Incidence of Food and Inhalant Allergens in 315 Cases of Childhood Asthma. Data on less common causes are given in Table I

TABLE I
INCIDENCE OF SENSITIZATION TO ALLERGENS AMONG 313 CASES OF
CHILDHOOD ASTHMA

<i>Inhalants</i>	<i>Cases</i>	<i>Per Cent</i>
Alternaria	213	67.6
Ragweed	133	42.9
House Dust	120	38.1
Helminthosporium	77	22.5
Grass	56	17.8
Monilia Sitophila	31	9.8
Cattle Hair	21	6.7
Hormodendrum	11	6.7
Elm	17	5.4
Cottonseed	16	5.1
Cat Hair	13	4.1
Pyrethrum	11	3.6
Western Water Hemp	8	2.5
Feathers Dog Hair	7	2.2
Russian Thistle*	6	1.7
Rabbit Hair	3	1.0
Kochia Horse Hair	4	1.3
Silk Orris Root	2	0.7
<i>Ingestants</i>		
Milk	128	40.6
Chocolate Cola	62	19.7
Egg	37	11.7
Legumes	31	9.8
Corn	25	7.9
Wheat Tomato Citrus	9	2.9
Pork V.S.A.	8	2.5
Food Dyes Walnut Pecan	6	1.7
Apple Fish Potato Cinnamon	3	1.0
Beef Plum Family Grape	4	1.3
Cabbage Foods Barley Oat Onion	3	1.0
Mint Family Beet Spinach Bananas		
Lamb Pineapple	2	0.7
Cantaloupe Shrimp	1	0.3

*Does not grow in Kansas City area incidence is very high among patients from its habitat

which have proved significant in allergy. They will appear in their approximate order of importance.

Compositae

The composite family includes such beautiful flowers as asters, zinnias, and chrysanthemums, and such attractive weeds as goldenrod, dandelion, and daisy. Since all these are insect pollinated they are not hay fever plants. However, many composites have degenerated into wind pollination and in the process have become the allergic scourge of North America. Included in this category are the numerous types of ragweed and sage. There is considerable cross sensitivity among these plants.

Ragweeds. The term ragweed applies particularly to members of the genus which has been fantastically misnamed Ambrosia. Included under this heading are small (common) ragweed, giant ragweed, western ragweed, southern ragweed and others of less importance. Although there are some who dissent, these plants are probably from a practical therapeutic standpoint antigenically identical. Their importance rests on the fact that their pollens are remarkable for their buoyancy, toxicity, and productivity. They particularly infest areas of extensive agriculture, but one type or another is likely to be found almost anywhere.

There are several other members of the ragweed tribe which are so closely related to the true ragweeds as to be either antigenically identical or nearly so. Among these are burweed marshelder (prairie ragweed), rough marshelder, the false ragweeds, and cocklebur. Burweed marshelder is in some dry areas the dominant ragweed, and should receive special attention where this is true. Cocklebur is a poor pollinator and is seldom considered of importance.

Artemisia To the artemisia family belong the sages sagebrush and wormwoods and where these abound they should be given individual attention In areas where rag weeds are the dominant composites however Brier¹¹ feels that sage is probably of academic interest because it interacts with ragweed pollen

Grasses

The most widespread source of pollen allergy not only in the United States but in the world is the grass family Of the thousands of species a comparatively small number possess the qualities necessary to make them important Their pollens are quite antigenic but fortunately are not as buoyant as those of many weeds and trees and do not usually appear in the air in heavy concentration

To the great simplification of the allergist's task most grasses cross react more or less perfectly For example the common lawn and pasture grasses blue grass timothy orchard grass and redtop are scarcely to be distinguished antigenically and some allergists use timothy exclusively for testing and treatment Two exceptions to this satisfactory state of affairs are Bermuda grass and Johnson grass which interact poorly with other grasses¹²

Chenopods (Goosefoot Family)

The most important of the chenopods is Russian thistle a tumbleweed This great pest of the plains and Rockies is responsible for a tremendous amount of severe respiratory allergy wherever it is found A close relative is burning bush (*Kochia scoparia*) and although its pollen is apparently less antigenic than Russian thistle¹³ it is nevertheless an important antigen Another common weed of this family is lamb's quarters but in children it

least, it is of dubious importance

Amaranthus (Pigweeds)

This family furnishes a wide variety of prolific and noisome weeds. Although much mentioned in the hay fever literature, skin reactions are rarely found, at least in the Kansas City area. The one exception is western water hemp, and since it flowers at about the same time as the ragweeds, failure to consider it may lead to poor results in late summer pollinosis.

Trees

In view of their wide distribution and large pollen production, it is surprising that trees are not of more allergic importance than they are. This may be because of their short seasons, or because they pollinate mostly in the early spring before houses are open. Where the season is long, as is the case with oaks in certain mountain areas," they may be of considerable importance. In cities where elms are plentiful, this pollen appears in enormous volume in late winter (Fig. 4) and not uncommonly is responsible for severe respiratory allergy. Mountain cedar has long been known as a source of severe pollinosis in parts of the Southwest.

Other trees whose pollens appear on atmospheric slides are maple (and box elder), sycamore, pine, poplar (and cottonwood), pecan, mulberry, walnut, hickory, beach birch and others. None of these have been found important in the Kansas City area.

Other Plants

Among plants occasionally suspected in respiratory allergy are plantain, beet, dock, privet, rhubarb, acacia, buckwheat and mesquite. Where the allergist finds these

pollens on his atmospheric slides he is justified in testing patients for them no matter how little attention they have caused in the hay fever literature. On the other hand if he tests with them when they are either absent or none of his patients have symptoms at the time of their flowering he will confuse himself and waste much time and effort.

An interesting hay fever plant is hemp (marijuana Cannabis). Over most of its distribution it is too scattered to be a significant factor but in the Omaha Nebraska area where it was once grown as a source of rope it has escaped from cultivation and become an important local pollen.

A baffling problem in extensive areas of the South is hay fever X. It occurs throughout the coastal plain and at last reports efforts to determine its etiology have been unsuccessful. Unfortunately for its victims it is a common type of hay fever.

Which Pollens are Important?

Although the whole subject of pollen allergy is complex the local situation in any given area is relatively simple. It is the responsibility of each allergist to find out what his own problem is and to help him in this task he may draw on many excellent sources of information. He often can get this information from allergists working in his area or he may consult Sampter and Durham's *Regional Allergy* a very useful book which combines the collective experience of allergists working in all sections of North America. He will learn much by looking about him and finding for himself the plants present in his community. An excellent help in this endeavor is *Hay Fever Plants* by Wodehouse. Further information may be obtained from county weed control officers and from books on weeds grasses and other plants which these officers can

furnish or recommend. For example, the writer has found the following books of the greatest interest and assistance: *Weeds of the North Central States*—a publication of the University of Illinois Agricultural Experimental Station, Urbana; and *Weeds in Kansas* and *Grasses in Kansas* by Frank C. Gates, published by the Kansas State Board of Agriculture, Topeka. Watching the plants about him is one hobby the busiest physician can cultivate and enjoy.

MOLD ALLERGENS

The discovery that soil fungi or molds are important inhalant allergens has been the most noteworthy development in recent allergy history. These organisms will grow in almost any place where there is sufficient moisture, but their great reservoir is the soil. They are important environmental allergens in areas of extensive agriculture, in older houses, in poorly drained areas, and near bodies of water.

The allergenic factor of most importance in mold allergy is the asexual spore or conidium, but it has recently been demonstrated that the mycelium or vegetative portion of the fungus is antigenic as well.²⁰ These organisms would be of limited interest if they acted only as environmental allergens. Their real importance lies in the fact that their spores invade the air in force and during warm months constitute a seasonal allergic problem of the first magnitude.

Important Molds

Alternaria. There is general agreement that *Alternaria* is the most important fungus allergen in the United States.^{21,22} It is a vigorous organism thriving under conditions which discourage other molds. In most areas it is active throughout the greater part of the year, becoming

dormant only in the coldest weather. In the South it may be present throughout the entire year.

Alternaria has an interesting seasonal incidence (Fig. 4). In the Midwest it begins to sporulate at the first sign of thaw in the late winter and continues to be a source of trouble from March through November. Spores appear in the air at any time when the ground is not frozen, saturated with rain, or covered with snow. Although prolonged dry weather has a tendency to inhibit this fungus, even conditions of extreme drought do not stop its activity, and, in the Midwest, dry weather tends to give higher counts than rainy weather.

Since *Alternaria* grows rapidly on vegetation, especially grasses, harvest time (June for Kansas wheat) and hay cutting time are occasions for high counts. The combination of dead vegetation and fall winds makes October another favorite time for high counts.

Hormodendrum *Hormodendrum* is closely related to *Alternaria* and similar in habit and growth. It is especially prevalent in the spring, and on wet days it may exceed *Alternaria* in activity. It is considerably less important in allergy than *Alternaria*.

Other Molds

Of the thousands of species of soil molds, only a few appear in sufficient strength to be clinically significant²⁰. A common bread mold, *Monilia sitophila*, is very active antigenically and is a common reactor. Probably because their relationship to *Alternaria* is very close. *Helminthosporium*, *Spondylocadium*, and *Curvularia* are common skin reactors, but, except for occasional 'showers' their spore counts are low. Also worthy of mention are *Aspergillus*, *Penicillium*, *Fusarium*, *Rhizopus*, *Absidia*, *Phoma*, *Mucor*, *Chaetomium*, and *Pulullaria*. Baker's yeast and

brewer's yeast are of occasional importance in children. One of the writer's mold patients has developed severe symptoms from stirring hot roll mix and from inhaling fumes from 'yeasty' beer. Mold patients do not tolerate the drinking of beer or the eating of certain cheeses or other foods which contain fungi. It should be noted that many present day cheeses are processed and do not contain molds.

ATMOSPHERIC STUDIES

To obtain the best clinical results in pollen and mold allergy and to know one of the real pleasures of the practice of allergy, the allergist will want to do his own air studies. He may use a simple technique consisting of the daily study of greased slides which have been exposed each 24 hours in the open air, or he can use more highly perfected techniques suitable for research studies. The writer's method which will be given below is a simplified adaptation of the standard method.

Materials

The necessary materials for atmospheric study are (1) pollen shelter, (2) glycerin jelly, (3) microscopic slides.

The Shelter (Fig. 3). The shelter used is modeled closely after the device designed by Durham. It consists chiefly of two disks of galvanized sheet iron or other rust-resistant material, 9 inches in diameter, held 3 inches apart by three bolts. In the center of the lower disk a painted block of wood is fastened. It is 1 inch high and has the dimensions of a glass slide. Two thin metal clips hold the slide in place on the block. The shelter is supported on a vertical pipe with a base or may be placed on a bracket. The pipe is fastened to the lower disk and to a

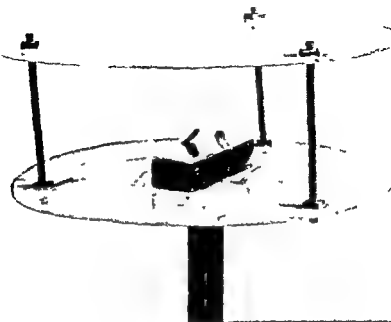


Figure 3 Pollen Shelter

base with floor flanges, obtainable from plumber's supply stores

The most accurate counts are obtained if the shelter is placed on the highest point of a tall building, but the practitioner is more likely to be faithful in his counting if it is placed outside a convenient window

Glycerin Jelly This material is prepared as follows Soak some gelatin for 2 or 3 hours in cold water pour off the superfluous water and heat until melted To 1 part of this add $1\frac{1}{2}$ parts of glycerin and while still hot filter through spun glass pressed into the lower part of a heated funnel Add 2 or 3 per cent phenol Still keeping the mixture hot and fluid add drop by drop a saturated solution of methyl green in 50 per

cent alcohol until the glycerin jelly becomes fully as dark as green ink (The method given here is that of Brandt¹⁰ The writer has succeeded in filtering with filter paper instead of spun glass)

Preparation of Slides A drop of melted glycerin jelly is placed on a slide and smeared to a thin film. A number of slides may be prepared at one time and stored in a covered slide box. Each morning a slide is labeled with the date and placed in the shelter

Counting Technique

The method of counting spores and pollen grains is much like that of the blood count.¹¹ Instead of counting

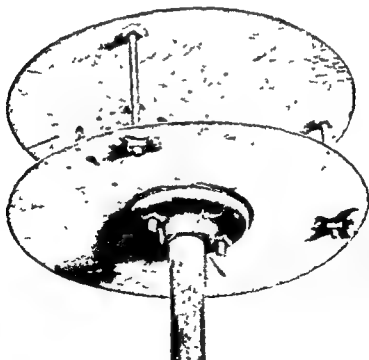


TABLE II
FOUR AND MORE CLUSTERS
Kansas City, 1926

February*	March	April	May	June	July
Alternaria	Alternaria	Alternaria	Alternaria	Alternaria	Alternaria
Helminthosporium	Helminthosporium	Helminthosporium	Helminthosporium	Helminthosporium	Helminthosporium
	Fern	Fern	Helminthosporium	Helminthosporium	Helminthosporium
	Maple	Maple	Oak	Pine	Grass
		Oak	Willow	Grass	Chenopodium
		Willow	Cedar	Dock	Rusts
		Cedar	Poplar	Rusts	
		Poplar	Pine		
		Pine	Walnut		
		Walnut	Sycamore		
			Grass		
* Studies not done in January					

TABLE II (Continued)
 POLLEN AND MOLD CALENDAR
 Kansas City 1956

August	September	October	November	December
Alternaria	Alternaria	Alternaria	Alternaria	Alternaria
Hormodendrum	Hormodendrum	Hormodendrum	Hormodendrum	
Helminthosporium	Helminthosporium	Helminthosporium		
Grass	Grass	Grass		
Cenopod amaranth	Cenopod amaranth	Cenopod amaranth		
Ragweed	Ragweed	Ragweed		
Rust	Rusts	Hemp		
Composites	Composites			
	Hemp			

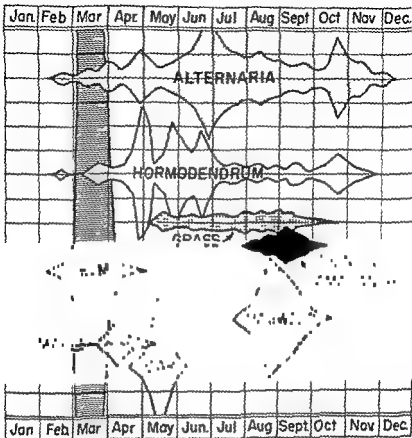


Figure 4 Mold Pollen Count, Kansas City 1956 Weekly Averages
 Distance between horizontal lines represents 10 pollen grains or spores For calendar showing minor pollens and spores see Table II

elements in squares, however the pollen mold count includes all elements found in the low power field during five trips across the short dimension of the slide The examiner places the slide in the stage with one end under the objective He begins the count at the upper edge and

completes it at the lower. He moves a short distance along the slide and repeats the same process in the opposite direction. After a total of five such trips across the slide the count is complete. The total of each type of grain or spore seen makes up the mold and pollen count for the day. Pollen counts are tabulated and kept in graphic form as shown in Figure 4. For a more complete list of seasonal allergens, see Table II.

Identification of Pollens and Spores There is no better way for the beginner in air studies to become familiar with air borne substances than to acquire known specimens and mount them in glycerin jelly. In Figures 5 and 6 microphotographs of common pollens and spores are shown. Further material on this subject may be obtained from the work of Durham and McKay,¹⁰ Wodehouse,¹¹ Brown,¹² Christiansen and Swacably,¹³ or the standard textbooks of allergy.

NONSEASONAL INHALANTS

Inhalants to which a patient may be exposed at any time are known as nonseasonal inhalants. This is not a strictly accurate designation, as there is some difference in exposure according to the time of the year, but in this group we do not find the striking periodicity characteristic of pollens and molds. Included under this heading are farm and industrial inhalants and such household allergens as animal furs, house dust, and insecticides. This section will be devoted to a discussion of this class of antigens.

House Dust

A remarkably potent allergen is produced as a result of the aging and degeneration of cotton and other organic materials. For want of a better term, this substance, a fine

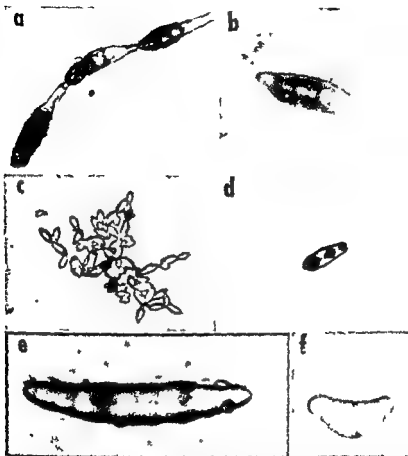


Figure 5 Common Mold Spores (a) *Alternaria* The spores are often seen in chains of two to four or more but are usually seen singly as in (b) (c) *Hormodendrum* Spores are usually in groups usually some five to ten to the group Spores vary considerably in size (d) *Helminthosporium* small size (e) *Helminthosporium* usual size (f) *Spondylocadium* The spore shown in (d) is from a culture all others are from atmospheric slides ($\times 640$)

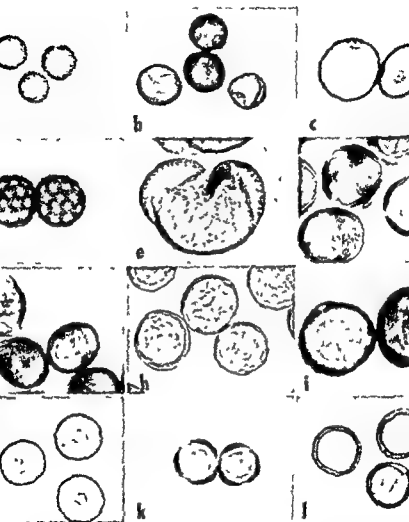


Figure 6 Common Pollen Grains (a) Ragweed (b) Hemp (*Cannabis*) (c) Grass (d) Russian thistle (e) Pine (f) Maple (g) Oak (h) Elm (i) Hickory (j) Cedar (k) Sage (l) Poplar (x640).

gray powder is called *house dust*. It occurs in all houses to a greater or less extent and has been found in all climates. It is a very common offender in adults and although less commonly seen in children it is still an antigen of considerable importance. House dust sensitivity is very prevalent in lower income groups because of greater exposure to old furniture and old living quarters. In winter when houses are closed and furnaces are busy it is especially important. It is produced in abundance from mattresses, pillows, stuffed furniture and to a considerably less extent from stuffed toys, lint and books.

Animal Epithelials

Among the most potent inhalant allergens are the epithelia of mammals including hair and dander. The feathers of birds are less active allergens but are of definite importance. Because dogs and cats are such common house pets these two sources are of first importance in childhood.

Source of Epithelials The child who is sensitive to cats and dogs will have difficulty not only from sharing a house with them but in some cases may have symptoms from hair attached to the clothing of playmates or react to the presence of these animals on outdoor contact. Farm contact accounts for most cases of allergy to horses, cattle and other stock but clothing of those handling animals may affect extremely sensitive children. Rug pads made of cattle hair are an occasional but important source of cattle hair allergy. Feather pillows, comforters and feather beds are both epithelial and house dust contacts. Rabbits are sufficiently common as pets to constitute a minor allergic problem. Because of the fact that they are carefully cleaned before use, wool (in fabrics) and horse hair (in furniture) do not seem to be active antigenically.

Miscellaneous Inhalants

Pyrethrum Pyrethrum an insecticide is a common and active allergen. It is manufactured from the flower of a plant closely related to the ragweeds and since the commercial product contains pollen it is a common offender in ragweed sufferers.

Cottonseed Although cotton fiber is nonantigenic the seed may cause the most severe allergic reactions. Sensitive patients have symptoms from sleeping on unprotected mattresses and from contact with certain cattle feeds. Cottonseed meal is sometimes used in the manufacture of candy and in baking and is a menace to patients highly sensitive to this antigen. Cottonseed oil on the other hand is considered antigenically inert by most allergists.

Orris Root This active allergen was formerly much used in cosmetics but few patients now react to it. Its source is the rhizome or root stock of an Italian iris.

Silk The return of silk to common use is bringing this antigen back into prominence. It is used in scarves, Japanese jackets, suits and in many other ways. Silk is of insect origin and allergy to it may be related to allergy to moths, May flies, etc. In the vicinity of large bodies of water such as the Great Lakes, insect emanations may be important seasonal inhalants. Allergy to these inhalants is detected and treated in the same way as with pollens and molds.

Tobacco Smoke Many children complain when exposed to heavy concentrations of tobacco smoke. In most cases the smoke probably acts as a primary irritant but in others it acts as a true antigen.²⁰ It is probably never necessary to completely exclude asthmatic children from the presence of tobacco smoke but it is wise to see to it that

they are not exposed to the heavy concentrations often found at parties, in closed cars, etc

Less Common Inhalants

Other inhalants which have been reported are kaaya gum, goat hair, hog hair, insect emanations, flaxseed derris root (rotenone), smuts and rusts guinea pig hair white rat and mouse hair, wheat flour, kapok gum acacia fish glue, castor bean dust, coffee bean dust wood shavings, saw dust None of these is common in pediatric practice, but in puzzling cases or special situations, these and others may need to be considered

Chapter 4

ETIOLOGY OF ASTHMA: FOODS, DRUGS, INSECT BITES, NONSPECIFIC FACTORS

FOOD ALLERGENS

In view of the fact that allergic children become sensitive to inhalants on the basis of relatively casual contact it is not surprising that their heavy exposure to foods leads to a great deal of food allergy. This exposure to foods is overwhelming in infants. For example, a 15 pound baby taking 1 egg yolk and 1 quart of milk daily (as many do) may be compared to a 180 pound man on a daily intake of a dozen egg yolks and 3 gallons of milk! When we further consider the evidence that the gastrointestinal tract of infants is permeable to a foreign protein we may well wonder that food allergy is not more common and important than it is.

Which Foods are Important?

Any food seems to be capable of sensitizing, but there are several which are encountered with especial frequency. Generally speaking, the leading allergens are common foods like milk, grains, legumes, and eggs, but certain others like chocolate, nuts, cinnamon, and crustaceans seem to owe their importance to high inherent antigenicity. In Figure 2 and Table I the relative importance of foods in asthmatic children is shown.

The Biological Relationship of Foods

Nothing has clarified our understanding of food allergy more than the discovery that foods which are members of the same botanical or zoological family tend to interact antigenically²² In this section the various food families and their members are listed It will be noted that allergically speaking the terms fruit vegetable protein, greasy food, sweets seafood rich food starchy food' spicy food, etc have little or no place As allergens foods are classified according to their place in the plant and animal kingdom only In the next chapter we will see how this relationship becomes useful in determining which foods are important in asthma

The following Food Families list is the one which the writer gives to the mothers of children with a food allergy problem

Food Families

Allergy to one member of a family of foods often means allergy to other members This is especially true of many families (pea family citrus family) but less so of others (mammal family)

Apple Family Apple pear quince

Aster Family Lettuce is most common Others are chicory endive escarole artichoke dandelion sunflower seeds tarragon (Ragwort and yige belong to this family also the insecticide pyrethrum)

Beet Family Beet spinach chard lamb's quarters (Hay fever plants in this family are Mexican fireweed and Russian thistle)

Blueberry Family Blueberry huckleberry cranberry

Buckwheat Family Buckwheat rhubarb garden sorrel

Cashew Family Cashew pistachio mango

Chocolate Family Chocolate (cocoa) and cola

Citrus Family Orange lemon grapefruit lime tangerine kumquat citron

Fungus Family Mushroom and yeast (The molds that cause infant allergy belong to this family Also antibiotics)

Ginger Family Ginger cardamon turmeric

Gooseberry Family Current and gooseberry

Grains (Cereal or Grass Family) Wheat corn rice oats barley rye
Also wildrice cane millet sorghum bamboo sprouts (The hay fever
grasses belong to this family)

Laurel Family Avocado cinnamon bay leaves sassafras

Mallow Family Cottonseed and okra

Melon (Gourd) Family Watermelon cucumber cantaloupe pump
kin squash and other melons

Mint Family Mint peppermint spearmint thyme sage horehound
marjoram basil savory rosemary balm (melissa) catnip

Mustard Family Mustard turnip radish horse radish watercress
and varieties of cabbage The varieties of cabbage are cabbage chinese
cabbage broccoli Brussel sprouts collards kale cauliflower kohlrabi
and rutabaga

Myrtle Family Allspice guava clove pimento (not pimiento)

Onion Family Onion garlic asparagus chives leeks sarsaparilla

Palm Family Coconut and date

Parsley Family Carrot parsnip celery parsley celeriac Also the fol
lowing spices anise dill fennel angelica celery seed cumin coriander
caraway

Pea (Legume or Clover) Family Peanuts Peas (green field black
eyed) Beans (navy lima pinto string soy etc) Less important are
licorice arachia tragacanth

Plum Family Plum cherry peach apricot nectarine wild cherry
almond

Potato Family Potato tomato egg plant peppers This family in
cludes all foods called pepper except black and white pepper such as
green pepper red pepper chili pepper paprika pimiento cayenne
capsicum (Tobacco belladonna stramonium and hyoscyamus belong in
this family)

Rose Family Strawberry raspberry blackberry dewberry and such
developed berries as loganberry youngberry boysenberry etc

Walnut Family English walnut black walnut pecan hickory nut
butternut

Animal Kingdom

Mollusk Family Oyster clam abalone mussel

Crustacean Family Crab lobster shrimp

Fish Family All true fish either fresh water or salt water such as
salmon tuna sardine catfish trout crappie etc etc (Fish sensitive
patients often cannot handle or otherwise come in contact with fish glue
like LePage's)

Bird Family All fowl and game birds chicken turkey duck goose guinea, pigeon, quail pheasant etc

Although egg belongs to this family it does not seem to be related to chicken allergy except the meat of laying hens may cause trouble in egg sensitive cases

Reptiles These are eaten very little but it is interesting that both turtle and rattlesnake meats are available The frog an Amphibian is not a common food

Mammal Family Beef pork lamb rabbit squirrel venison etc Cows milk is of the same animal origin as beef and there is a slight tendency for those who are milk sensitive to be allergic to beef Most persons allergic to cow's milk cannot take the milk of other animals such as the goat

Foods Without Relatives

The following foods are the only members of their botanical family which are commonly used as foods in the United States Arrowroot banana black (white) pepper Brazil nut capers chestnut chile coffee elderberry fig grape hazelnut (filbert) honey juniper flaviced karaya gum maple sugar New Zealand Spinach nutmeg (mace) olive oregano papaya pineapple persimmon poppyseed saffron sesame seed sweet potato tapioca tea vanilla wintergreen water chestnut

Mineral Kingdom

Many flavors coloring agents medicines etc are of mineral origin Pop hoolade Popsuckles Jello and candies are artificially colored and flavored Occasional trouble is caused by these agents

Aspirin is the most important medicine causing allergic reactions It is found (usually under the name of acetylsalicylic acid) in a wide variety of preparations like A.P.C. Anacin Bufferin Alkascizer

The medicines used in allergic children seldom cause allergic reactions but if any seem to cause trouble they should be watched

From this outline you can see that there is no such thing as being allergic to all nuts seafood fruits starches green foods spices etc

Notice that these are not related

- tuna and shrimp
- white potato and sweet potato
- wheat and buckwheat
- black and red pepper
- crab and clam
- raisin (grape) and prune (plum)
- peanut and other nuts
- almond and other nuts

Notice that these foods are related

coffee and tea
ginger clove and cinnamon
apple and pear
peach and plum
pea bean peanut
wheat corn other grains
beet and spinach
chocolate and cola drinks
onion garlic asparagus
cucumber and melons
walnut and pecan
carrot and celery

Sources of Foods

A number of workers have patiently and efficiently compiled detailed lists of food which are the source of various common antigens. These lists are very useful for adults who must eat in restaurants but in childhood practice the writer has found it more practical to give the mother a general list of sources and encourage her to learn to read labels on food packages. Since mothers are experts on foods they can be very easily taught to keep a child on a diet which is safely free from the food being avoided and if the allergist makes certain that she understands that this avoidance must be total he will find that he need have no fear as to her role in diet studies. General lists of food sources are to be found under "Food Testing" page 64.

DRUG ALLERGENS

Although drug allergy is not of outstanding importance in childhood asthma, the possibility that either prescribed drugs or patent medicines may act as allergens is to be kept in mind. Easily the outstanding drugs to watch in the asthmatic child are aspirin and penicillin. As is true of allergy to insect bites (see below), allergy to drugs often acts more like anaphylaxis or serum sickness than

clinical allergy or atopy.² That is to say drugs are more likely to produce urticaria rashes arthralgia or fever than asthma eczema rhinitis or migraine.

Aspirin Aspirin has the distinction of being the most common drug in modern use but it also is the most common childhood poison and in asthma at least the most common drug allergen.^{3,4} Aspirin asthma is invariably severe and since the drug is routinely given for childhood colds attacks due to aspirin are commonly thought to be a result of the cold. It is wise to discourage aspirin in asthmatics and where its use is allowed it should be carefully watched. The writer routinely forbids it in severe cases.

Penicillin Penicillin has become a very important allergen especially in dermatology. Bronchial reactions are by no means rare however and the asthmatic who gives a history of any type of allergy to penicillin should not be given this drug.^{5,6,7}

Other Drugs Brown lists the following drugs as those most commonly associated with bronchospasm: acacia aspirin ACTH anesthetic agents antihistaminic agents argyrol the arsenicals atropine atropine asthma powders cocaine cortisone derrick root demerol digitalis emetine heparin insulin iodides⁸ ipecac curare gum liver extract lycopodium the mercurials morphine pan topon para aminosalicylic acid penicillin pollen extracts privine pyromen sera streptomycin sulfonamides⁹ trka diastase trinnic acid tetraethylammonium bromide thiamine and vaccines. Although the introduction of diphtheria and tetanus toxoids has greatly reduced the indications for its use horse serum remains an extremely dangerous agent in susceptible children. An asthma patient of the writer died in another city minutes after being given antitetanic serum. No history was taken prior to

injection and no skin test was made.

The physician who is sparing and cautious in his use of drugs will save his families and himself a great deal of trouble. Many drugs in overdosage are poisons and all are potential allergens. Arsenic deserves special mention because of its current use as a specific in asthma and its dangers need the strongest emphasis."¹¹

ALLERGY TO INSECT BITES

As Loveless and Tucker have pointed out sensitization to insect venoms is more in the nature of anaphylaxis or serum sickness than atopy. This means that the normal individual is probably as likely to become sensitized as the allergic individual and that the reaction will be one of severe edema rather than true asthma.¹² The asthmatic child with his sensitive lower respiratory tract however would seem more likely to react with edema of the glottis or with pulmonary edema and such a case should be viewed with the greatest respect and caution.

Prevention The principle of avoidance applies strongly in the field of allergy to insect stings. Any child who gives evidence of any type of hypersensitivity to insects should be taught to avoid places where bees and wasps abound. It is wise to avoid the planting of outdoor flowers, flowering shrubs and clover in the yards of patients with bee sensitivity. The child should also be prevented from playing about old sheds, muddy places, basements and other areas frequented by wasps.

Treatment of the Reaction The treatment of a severe insect reaction is identical with that of the management of a constitutional reaction to hyposensitization (page 91).

Desensitization True desensitization is possible in insect allergy. Glaser¹³ in a modification of the method of Mueller and Hill¹⁴ recommends beginning with a 1 cc

1 000 000 dilution and working up cautiously to 1 to 10. He recommends 3 years treatment. Swinnery²⁰ whose experience is extensive advises prolonged follow up of patients to make certain that there is not a gradual return in sensitivity.

NONSPECIFIC CAUSES

Infection

Easily the most important nonspecific factor in childhood asthma at least in infants is infection.²¹ Its role is so important in fact that it has been argued that bacteria act as specific antigens in asthma. It is true as we have seen in Chapter 1 that infection is a very common trigger mechanism and it is also true that asthmatic children are often much given to colds and other respiratory infections but attempts to demonstrate the specific etiologic role of bacteria in asthma are not conclusive. Any child with an infection amenable to treatment should be treated for it of course and this is eminently true of a child already ill with asthma. If the physician wishes to use bacterial vaccines he may justify himself with the contention that they may be nonspecific stimulators of the immune mechanism. Crump has reported good results in resistant cases from the use of vaccines made from bronchoscopic culture.²² It has long been suspected that focal infection may play a role in childhood asthma and this point of view has found a strong advocate in Chobot.²³ However most workers find that surgical removal of lymphoid tissue or other tissue in an effort to remove focal infection is not effective.²⁴ There is in fact a suspicion that removal of tonsils and adenoids may act as a stimulus to the development of respiratory allergy in susceptible children.

Primary Inhalant Irritants

Any substance which is irritating to the normal

respiratory mucosa may act as a nonspecific factor in childhood asthma.¹¹ Of particular importance are materials used in interior decoration such as paint, varnish, shellac, lacquer, linseed oil, turpentine and other thinners, ammonia, and paint removers. These and a long list of similar substances can contribute to the development of an attack of asthma. It would be impossible to list all the other sources of irritation, but among them are soap powder and detergents, insecticides, menthol, camphor ether, tobacco smoke and other smokes, saw dust, perfumes, sulfur trioxide and dioxide,¹² hydrogen sulfide, cleaning fluids, flower odors, food odors,¹³ kerosene, gasoline, formalin and illuminating gas. Some of these act as allergens rather than as simple irritants, and in any given situation it is often impossible to say which mechanism prevails.

It is remarkable how often primary irritants combine with allergens to upset allergic balance. Cases like the following, a hypothetical one, are not uncommon.

A child sensitive to house dust, *Alternaria*, and the ragweeds is well controlled. During the Labor Day week end his father undertakes to redecorate the living room. In the process of removing wall paper and hammering on mop boards he stirs up a large volume of house dust and molds. He uses ammonia to clean woodwork and with a sander raises a cloud of wood dust and old paint. He uses a paint remover to loosen a heavy layer of varnish from a door and uses fish glue to repair it. The paint, an unusually odoriferous product, is thinned with turpentine and stretched with linseed oil. While at work the amateur decorator solaces himself with large, black cigars. By the time the job is finished the air has been sufficiently polluted to fill any allergist's heart with horror, and being done at the height of the ragweed and *Alternaria* season, the child is exposed far beyond his tolerance and goes

into a severe attack of asthma. A case of this type shows not only the importance of inhalant and irritant avoidance, but the necessity of thorough indoctrination of the families of asthmatic children.

Physical Factors

Thermal Factors An important factor in childhood asthma is temperature change. Many children are especially intolerant of chilling, and at the first visit, the mother may object to the child being disrobed for examination and testing. An occasional patient reacts similarly to being overheated. Whether thermal reactions are actually allergic phenomena (physical allergy) or nonspecific factors is not settled, but since the patient who is properly controlled tends to gain tolerance to thermal factors, the latter view seems more probable.*

An interesting form of thermal intolerance is seen in the patient who wheezes after laughing, exercise, crying or other activity which increases the respiratory exchange. In some cases this is a result of the extra load on the limited vital capacity, but in others it seems to be a result of a large volume of cold air being drawn into the bronchi.

Humidity Humidity has often been suspected of being a deleterious factor in asthmatics and it often proves to be. According to Markow and Reicher* however, most patients apparently intolerant of damp weather are so because in the rainy season in the East the mold count is often high. Dry climates are often advocated for asthma, but according to Perlman,* 'Very low relative humidities can be harmful in a more subtle way because of the drying of the mucous membrane.' Probably the best answer to the effect of moist air and dry air lies in the unexplained fact that some patients best tolerate humidity, others aridity.

whose asthma began early and whose attacks are severe and frequent will of course be likely to have multiple allergies and react slowly to treatment.

Possible Allergens At the beginning of a survey of allergens the mother is asked if she suspects any food of causing asthma. Although the allergist is seldom fortunate enough to get such a history it is well worth the asking. The infancy history is of the greatest importance as the allergic baby often reacts violently to food allergens and many of these are permanent sensitizations. A history of eczema, feeding problems, and newborn breathing difficulties (nasal or bronchial) may be of the greatest help in identifying such offenders as milk, egg, citrus fruits, and others.

Careful questioning about housing conditions, house pets, type of bedding, and reactions to house dust, smoke, and other inhalants is in order. If the physician knows the seasonal incidence of pollens and molds for the previous year, he can often correlate the history with pollen and mold peaks. It will help the mother remember the date of flare-ups if she is asked: How was he on his birthday on Memorial Day, on the Fourth of July, Halloween night, the Christmas holidays? His birthday, for example, may have happened to coincide with the peak day of the Alternaria season, and his mother may reply: He had an attack which ruined his birthday party. Flare-ups during the Christmas season raise the question of allergy to evergreens, house dust (on stored decorations or a result of careless holiday house cleaning), or a seasonal treat like chocolate or pecans.

Systemic Allergic Manifestations Careful investigation of systemic manifestations does two things. First, it gives information which will help in finding the causes of asthma. For example, if the investigator finds that the

child has a history of diarrhea from milk he may later find that the child has a latent sensitivity to this food which becomes manifest as a cause of asthma when he has a cold. Second it gives him the chance to relieve other allergic complaints. Parents who have become resigned to minor eczema headache or behavior problems are glad to see that the physician is very much interested in these problems as well.

Non allergic Manifestations While the child is under the close observation coincident to the management of asthma an excellent opportunity is presented for the discovery of other pathology. The allergic history should include non allergic factors in its scope.

The History Form

Since no one will remember all points of an allergic history a prepared history sheet is used. Not only is this necessary for completeness but as an important record to which the physician can refer at any time. Nothing will shake the family's faith in the allergist (which after many false starts and lost hopes is often shaky enough already) than for him not to be instantly aware of all important phases of the history. It is a mistake to keep a precise record of skin tests and laboratory tests many of which may be of no value whatever and hide an important point in the history in a mass of record.

The history sheet used by the writer is shown in Figure 7.

SKIN TESTING

The selection and number of skin tests depend on geography and the physician's preferences. Perhaps no two allergists not sharing the same office use quite the same selection. In Figure 8 the skin test form used by

Encircle outstanding findings		Underline other significant findings	
Infancy	Colic Vomiting	Eczema Diarrhea	Blocked nose Constipation
Nose	Blocking Sneezing	Discharge Freq URI	JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Chest	Cough Pneumonia	Asthma Croup	JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
G.I.	Anorexia Vomiting	Pain Constip	Diarrhea Foul breath
Skin	Urticaria	Eczema	
C.N.S.	Tension	Headache	Fatigue
Misc	Enuresis	Hyperhidrosis	
Inhalants	House Dust Molds	Cat Smoke	Dog Insecticides
Foods	Apple Apricot Aspirin Banana Barley Bean Beef Beer Beet Broccoli Cabbage Carrot Cauliflower Celery Cherry Chicken Chocolate Cinnamon Coconut Coffee Cola Corn Cucumber Egg Fish Food colors Grape Grapefruit Lemon Lettuce Melons Milk Nuts Oat Onion Orange Pea Peanut Peach Pear Pecan Pepper (green) Pepper (black) Pineapple Plum Pork Potato Rice Shrimp Spinach Strawberry Sweet potato Tomato Walnut Wheat		

Figure 7 Allergy History Record

1	2
Cattle Hair	Cottonseed
Cat Hair	Parakeet Feathers
Dog Hair	House Dust
Feathers mixed	Kapok
Horse Hair	Pyrethrum
Rabbit Hair	Silk
3	4
Orris Root	Tobacco
Aspergillus	Helminthosporium
Alternaria	Hormodendrum
Chaetomium	Monilia Sacophila
Fusarium	Penicillium
Grain Dust	Mucor
5	6
Burweed Marsh Elder	Red Oak
Elm	Russian Thistle
Mixed Grasses	Ragweed mixed
Kochia	Western Water Hemp
Johnson Grass	Apple
Bermuda Grass	Banana
7	8
Beef	Cashew
Black Pepper	Chocolate
Navy Bean	Egg
Cabbage	Grape
Carrot	Corn
Chicken	Milk
9	10
Onion	Pecan
Orange	Shrimp
Peanut	Tuna
Peach	Wheat
Pork	Yeast Baker's
Potato	Tomato

Figure 8 Skin Test Form

the writer is shown, and this may be used as a guide in selecting extracts. Extracts should be arranged in the rack so as to correspond with their order on this sheet.

In allergic skin testing, the extracts may be injected into the skin (intradermal or intracutaneous test) or applied to a superficial scarification (scratch or cutaneous test). There are advantages to both methods, but in pediatric practice at least, the scratch test is preferred. In investigative work, the skin of a donor who has been given intracutaneous injections of serum from an allergic patient is sometimes tested (passive transfer test) but this is of no practical value in the study of childhood asthma.*

Intracutaneous Test

The writer uses the intracutaneous test very little. Although it sometimes is more accurate than the scratch test, it is also considerably more painful, and has been the cause of constitutional reactions leading to death.¹¹ It must never be used unless a preliminary scratch test has shown the particular antigen to be a reactor of very low intensity, and it should be remembered that the traditional 0.10 cc. of the tuberculin test and other intracutaneous tests is far too much. Only enough to blanch a tiny area of the skin (about 0.02 cc.) should be used.

Scratch Test

Experience has taught that the most reactive and accessible areas for skin testing are the upper back and the lateral aspects of the upper arms. The area to be used is gently washed with alcohol or Zephiran. (If the skin is rubbed roughly it may temporarily reduce its reactivity.) As nearly as possible the child should be handled in a manner least likely to frighten him, because a frightened child often reacts poorly, probably because of an increase

in circulating epinephrine. Many times the child must be tested repeatedly until he overcomes his fear of the procedure.

The scratch may be made with any sharp instrument from a common pin to a small lancet. The scratch should not cause bleeding but should be deep enough to be visible. For several years the writer and his associates have used the Morrison microscratcher²² exclusively and its convenience and painlessness and the uniformity of its scarifications make it the instrument of choice. It consists of two main parts: a rotating core with two sharp points at the end and an outer casing (Fig. 9). The core rotates by spring power and the device is cocked by rotating a knurled knob at the end opposite the scratching points. When the cocked scratcher is pressed against the skin the points rotate sharply making the scratch.

After the child is prepared for testing the microscratcher is adjusted so that the points are just visible as the physician sights across the end of the instrument. Experience will show whether this is the correct setting and in any event the first scratch should be observed for a moment to see if the scratch is the correct depth. In infants and others with thin sensitive skins special care must be observed to avoid too deep a cut. After the required number of scratches have been made a small amount of extract (a large drop is wasteful and likely to 'run') is applied to each scratch according to its place in the rack. Twenty to thirty tests are sufficient for one sitting, and in infants a dozen is often enough.

After 10 to 20 minutes depending on when the reactions seem to be at their peak the tests are read. The reaction produced by the allergen is a wheal or hive surrounded by an area of erythema. There is usually considerable itching. If a small wheal appears which definite-

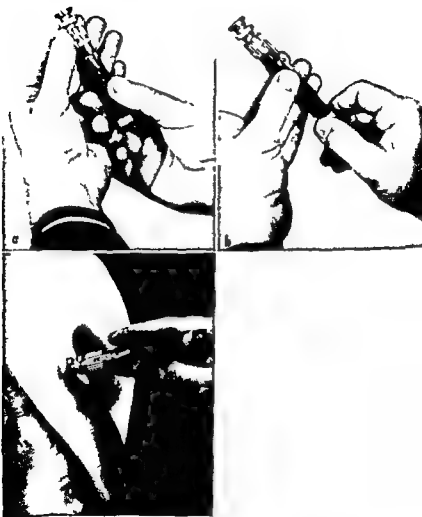


Figure 11 Morrison Microscratcher in Use (a) Setting depth of

ed by turning knurled end clockwise (c) Making the scratch by pressing scratcher against skin A skin marking pencil or ballpoint pen is used to mark location of scratch

ly extends beyond the circular scratch the reaction is recorded as 1 plus. If there is a large wheal 1 cm. or more in diameter the reaction is recorded 4 plus. Intermediate wheals are labeled 2 plus and 3 plus according to their intensity. Although erythema and itching corroborate the reaction it is the wheal that determines the reading.

Significance of Skin Reactions

Inhalants. Few tests in medicine are more accurate than skin tests for inhalant allergens. Allergy to pollens, molds, and the various epidermals and dusts may be detected accurately by either scratch or intracutaneous tests. A test need not be strong to be significant. If the history is positive for this antigen, a borderline reactor may usually be tentatively regarded as a factor in the case. It is here that an intracutaneous test may be of help.

There are occasional exceptions to the rule that inhalants are dependable skin reactors. False positives may be obtained at times because of an overreactive skin; these can be detected by comparing the reaction with that of other antigens or a control. At times the patient may have developed respiratory allergy before the skin becomes reactive. Buffum² has pointed out that this is common in infants. Another exception to the rule that inhalants are good reactors is dog hair. For some reason it is often negative in children definitely known to be dog-sensitive.

Foods as Skin Reactors. In view of their great importance in allergy it is most unfortunate that foods are poor skin reactors. "Not only do known offenders commonly fail to react, but quite innocent foods often give false positive reactions. One is tempted to give up skin testing for foods altogether, but not infrequently the solution of a case of asthma is greatly hastened by the appear-

ance of good skin reactions to foods. Skin testing for foods is somewhat more efficient in eczema than in respiratory allergy, and the child with associated eczema deserves the help that this method of testing may bring.

THE CLINICAL TESTING OF FOODS

The failure of skin testing to furnish an accurate means of identifying food allergens has forced the development of clinical or dietary methods of testing. There are several techniques, but all are based on the clinical response to food elimination and refeeding.

When to Test Foods

In severe asthma the writer begins food testing at the first visit. In milder cases, especially where the history suggests pure inhalant sensitivity, testing is delayed until it appears that inhalant treatment is not adequate for complete relief. It is often necessary to test common foods several times. One reason for this is the difference in food tolerance in the various seasons, and another is the fact that asthma in the early weeks or months of management is occasionally so severe that a minor food allergen may escape detection.

Selection of Foods For Testing

There are several considerations which govern the choice of foods to be subjected to clinical testing. The following criteria are useful in making the choice.

(1) A food with a history of causing any type of allergic reaction at any age should have first consideration. For example, a child who gives a history of prolonged colic or other 'feeding problem' should be suspected of milk allergy,* while an early history of vomiting egg places this food under heavy suspicion.

(2) A marked craving for a particular food may be evidence of allergenicity "

(3) Marked antipathy to a food in all forms suggests allergy to that food "

(4) Sensitivity to a particular food may be a family trait " and when the mother remarks "none of us can eat eggs" or "none of us can stand milk" the mentioned food is under some suspicion

(5) A strong skin reaction to a food allergen calls for clinical corroboration. False positives in foods are common

(6) If none of the above clues to food sensitivity proves useful, foods should be tested in the order of their incidence as allergens in childhood allergy (Fig 2). It is of course a waste of time to test a food which the child seldom or never eats

Technique of Clinical Food Testing

The method of food testing used by the writer is a modification of the Rinkel Individual Food Test *. Foods are usually eliminated for four days but any foods giving especially suspicious histories may be eliminated for 3 or 4 weeks while minor suspects are given 4 day studies. If feasible the child is examined shortly before the test again on the last day of abstinence and finally on the day following the return of the food to the diet. The mother has the responsibility of maintaining the dietary restrictions and of observing the child's symptomatic response to food manipulation. The form shown in Figure 10 is given to the mother marked with the symptoms to be observed and foods to be eliminated. Its use is explained in the opening paragraph of the form. She is also given a dietary form (Fig 11) so that a record of foods and symptoms may be kept.

Figure III Elimination Diets

Eliminate the foods marked below for a period of — days. During the last two days of the diet elimination see if the symptoms which are underlined below disappear or improve. On the last day or two of the diet elimination I will want to see him and again a day or two following the return of the food.

Symptoms Cough wheezing clearing the throat blocked nose runny nose headache muscle aches excessive sweating constipation diarrhea stomach ache foul breath tension fatigue bed wetting
1 Milk Milk buttermilk ice cream sherbet ices cheese cottage cheese custard and all creamed foods such as cream gravies soups potato dishes creamed vegetables butter oleo and most baked foods including bread. (Most children are not so allergic to milk that slight traces such as occur in butter will cause trouble but during testing the diet should be completely free of milk.)

2 Chocolate and Cola Chocolate cocoa coca cola Pepsiola and all carbonated drinks containing cola extracts.

3 Grains (a) Wheat Breads breaded foods breakfast cereals cream sauce flour macaroni spaghetti noodles crackers cookies gravies ice cream cones pancakes waffles bran pretzels cake doughnuts and anything made with flour. Rye bread and corn bread contain wheat and occasionally wheat is found in chili canned meats or fried foods etc.

(b) Corn meal corn syrup (most candy cookies canned fruit cough syrup chewing gum) canned corn corn on cob popcorn crackerjacks hominy beer grits fritos corn cereals tamales tortillas and many other Mexican foods.

(c) Oats (d) Rice (e) Rye (f) Barley (including malt) are used mostly in breakfast cereals.

4 Egg Ice cream (some brands) some noodles noodle soup meringue custard meat loaf French toast mayonnaise frostings some salad dressings croquettes ices some candies fritters. Almost all baked goods are made with egg exceptions being ordinary bread buns crackers and baby cookies. Be on your guard for foods containing even the slightest trace of egg because it must be completely eliminated.

5 Beans Peas and Peanuts Remember to take away peanut butter chili and candies made with peanuts or peanut butter.

6 Potato Tomato Egg Plant Peppers Tomato is found in many such mixed dishes as chili sauces salads salad dressings catsup pork and beans etc. Watch for potato in soups and as potato chips and sticks.

Figure 10 Continued

- 7 *Citrus Fruits* Orange lemon lime grapefruit tangerine citron
kumquat
- 8 *Apple Family* Apple (cider cider vinegar apple pectin jellies)
pear quince
- 9 *Plum Family* Plum prune cherry peach apricot nectarine
almond
-

CASE STUDY

The following case study is presented to illustrate the procedure used in working up a case of childhood asthma. Since the successful solving of an asthma problem calls for the collection of a great deal of information, this will be a rather long report. However, none of the findings listed are without value in a proper understanding of the case. The history is given in the way given by the mother in conversational language and in the present tense.

History

A 6-year-old boy, first seen July 7, 1953, has as his chief complaint asthma. The apparent age of onset was 3½ years. Attacks occur the year round, but are more severe and frequent in cold weather and are becoming more severe and hard to relieve with the passage of time.

Infancy. The patient was started on breast feeding and gained weight satisfactorily. However, he was so fussy that it was felt that he was not satisfied, and he was weaned to an evaporated milk and corn syrup formula. The baby's fussiness became worse when he was weaned, and the formula upset him in almost every way. There were frequent forceful vomiting, constipation, and a mild face rash. Numerous feedings were tried, all of which were based on cow's milk (dried, evaporated, or fresh), but there was little difference among them. The vomiting

ceased at about 6 weeks but colic persisted up to about the seventh month. During the first year there were several attacks of diarrhea which although not severe were inclined to resist treatment. As nearly as his mother can remember, he has never been entirely free of nasal stuffiness even as a new baby.

Nose For most of his life especially during the winter the child has suffered with colds, sore throats and ear infections. Even when apparently free of a cold he often rubs his nose and is compelled to breathe for the most part through his mouth. His tonsils and adenoids were removed at the age of 4 and for several months his mouth breathing was somewhat improved. Last year he developed typical hay fever beginning about the middle of August and lasting until frost.

Chest Asthma has been perennial but worse in winter. Comparison of the time of summer attacks shows that they correspond to known *Alternaria* peaks. The attacks are almost always severe and may last as long as 5 or 6 days. Oral medication including cortisone has seemed to be of little help. Coughing is confined largely to asthma attacks but at times there will be a troublesome night cough without obvious asthma.

Inhalants The mother suspects house dust largely because she herself sneezes when cleaning house and because when the child is in the cellar the stirring up of dust causes sneezing and cough.

The child gives a suspicious mold history. He always sneezes when his father cuts the grass and he has had a similar reaction to raking leaves and playing in dirt. Once during a visit to a farm he came down with severe asthma after playing in a grain bin.

There are no pets in the home and he is not in contact with other birds or animals. He has used a foam rubber pillow for the past year and a half. He always sneezes when his mother uses either a moth spray or mosquito spray.

Gastrointestinal System The child is a poor eater but has been somewhat better the last year. He craved milk during his second year of life and got to the point where he would take little else. This did not concern his mother because she felt that milk was the perfect food and that as long as he drank plenty of it he needed nothing else. At about two and a half the family doctor found the child to be quite anemic and suggested that he be cut back on his milk intake. Since then the child has shown less and less interest in milk but his mother insists that he take a glass of milk each meal.

The child frequently has foul breath especially in the morning. His mother thinks perhaps this accounts for his poor appetite for breakfast.

Skin The child has no present skin allergies. As noted there was apparently mild facial eczema the first months of life. During his second and third winter there was mild eczema of the forearm and arm folds. He had a severe attack of hives at the age of four but the cause was not determined.

Nervous System The child's mother states that he is very nervous. He is inclined to be cross and moody and if he doesn't get his way he will have tantrums some of which are rather severe. At times especially mornings he is listless and complains of tiredness and leg ache. When he was 2 or 3 years old he would often have severe leg pains at night. At the same stage he was a very poor sleeper and much of this seems to have been because of leg ache.

Miscellaneous The patient has always been a heavy sweater but this is less noticeable in the past year or two. He is inclined to urinary frequency and is given to occasional enuresis.

Physical Findings

The general appearance of the patient is one of chronic ill health. He appears listless and irritable. The

face is pale with dark circles of discoloration below the eyes. He is of asthenic habitus and has a slouching posture.

Head The tonsils are absent. The nasal mucosa is pale and of a grayish hue. The inferior turbinates are so swollen as practically to fill the anterior nasal cavity. Both tympanic membranes are lusterless and retracted.

Chest The rib cage is normal. On ordinary breathing no abnormal sounds are heard, but on forced expiration diffuse wheezing is heard. There are no definite signs of emphysema.

Abdomen and Extremities Negative.

Laboratory Findings

WBC 6800 56 polys 37 lymphs 5 eos 1 mono Hb 13 gm. Urine negative. Tuberculin negative.

Chest Roentgenogram Negative except for slight increase in peribronchial markings.

Nasal Smear Scattered throughout the smear are numerous eosinophiles about 15 per cent.

Differential Diagnosis

Nothing was turned up in history, physical examination, or laboratory to suggest disease other than asthma. A probable diagnosis of asthma was made and an allergy study continued.

Skin Tests

The significant reactors were Alternaria ragweed elm cat hair pyrethrum navy beans peanuts wheat. Because of a borderline reaction to house dust an intradermal test was done which was negative.

Clinical Food Tests

In view of the patient's stormy infancy, milk was withdrawn for a period of 1 month. Because of positive

skin tests to legumes (peanuts and beans) and wheat these foods were subjected to four-day elimination tests. Wheat was negative. While off legumes the patient seemed to feel better in every way, slept better and coughed less. While abstaining from legumes his nose was less congested and had better color. All findings became worse on a return to peanuts and beans. The test was repeated with the same result.

At the end of 3 months milk was returned to the child's diet. During abstinence he was unquestionably better. His nose was less congested, he ate better and felt better. On the night of returning to milk he developed a rather severe attack of asthma. His parents have refused to allow a refeeding of this food and the child himself shares their feeling.

Treatment and Follow Up

(Strictly speaking these two phases of management belong to Chapters 7 and 8 but they are so inextricably bound to etiologic diagnosis they will be discussed as the case report continues.)

Hyposensitization Treatment with *Alternaria* ragweed and elm extracts was begun, injections being given twice weekly the first 2 months, weekly until December, monthly through deep winter and then back to weekly injections. Minor reactions necessitated temporary cutbacks in treatment twice during the early stages of treatment.

Avoidance Milk and legumes were to be avoided strictly. The mother was carefully instructed in the sources of both categories. She was also carefully instructed in the avoidance of all common inhalants including those giving a negative skin test. Calcium wafers were prescribed.

Follow up After the first 8 months or so there were no attacks of asthma. Nasal stuffiness came under control much more slowly and there was more or less residual

ual congestion throughout the first year. During the second year of management nasal symptoms continued to improve to the point where there was no significant nasal blocking. After 3 years of treatment the child was dismissed as controlled.

WORKING OUT THE CAUSE OF ASTHMA IN INFANCY

The management of asthma in infancy does not differ radically from the management of the disease in older children but there are a few points that justify special consideration. In infants for example there must be more care in differential diagnosis. Asthma often acts more like bronchitis or whooping cough* than asthma while other diseases like foreign body in the bronchus or fibrocystic disease of the pancreas mimic asthma. Also the small air way and mucus producing tendency of infants makes for peculiarly severe attacks. Finally the dominance of food allergy in infancy colors the working out of the etiology of the case.† Most asthmatic infants later develop inhalant sensitivities and this calls for frequent retesting in such cases.

Since infants are worked up in the same general way as older children much the same routine of history taking and skin testing is used but in the following case study the differences in the work up are illustrated.

Case Study, Infantile Asthma

Present History A 9 month-old infant boy is brought in because of frequent spells of choking up, coughing and wheezing. His mother states that he always has a rattling in the throat and that about every two or three weeks he chokes up and wheezes for two or three days at a time. At times these attacks are preceded by a cold at other times they come on without warning usually at night. Two attacks have been so severe that the child's

lips became blue and he had to be taken to the hospital for treatment in an oxygen tent. There seems to be no change in intensity of attacks at various seasons.

Previous History Delivery was uneventful and the infant was a normal full term infant. He had no obvious difficulties with his formula but his mother says that he has always been a fussy infant. At about the age of 1 month he seemed to be more irritable than he had been previously and his mother thought he might be having stomach ache from cereals. She tried changing cereals and found that he was less irritable on rice and oats and she felt that mixed cereal (especially) and barley upset him. His stools were frequently loose for several days at a time.

Besides cereals the child has been fed all vegetables, fruit, egg yolk, mashed banana, baby cookies and beef. His mother does not feel that any of these make him irritable.

Inhalants The family are living in a new house and there are no house pets. The infant sleeps on a plastic covered mattress and he has no pillow or stuffed toys. He is seldom out of doors and is no worse after being taken out.

Physical Examination At the time of examination the child did not have active asthma. The nose seemed blocked but very little mucus was obtained on aspiration and in the smear there were neither eosinophils nor other cells. The chest was negative.

Skin Tests The infant was tested for house dust, Alternaria, Hormodendrum, mixed grasses, ragweed, milk, egg, oats, rice, wheat, barley, apple, peach, green beans, peas, carrot, sweet potato, egg, orange and chocolate. All skin tests were negative.

Diet Manipulation From the history there was doubt as to the compatibility of milk and cereals. Because of this these foods were eliminated. In an effort to isolate other possible causes vegetables and fruits were given on

separate days on a 3-day rotation. The child was given a soy milk formula sweetened with cane sugar. The mother was instructed to keep a diary of foods given and associated symptoms.

Progress Four days after being placed on his diet the child was entirely free of asthma. None of the foods of his rotated diet seemed to cause trouble and rotation was discontinued after 9 days and at the end of 2 weeks he was returned to milk. He remained free of asthma until being given wheat in the form of crackers and wheat cereal. He was kept off wheat for 1 week and at the end of that time was given barley cereal. The giving of barley was also followed by asthma. In the succeeding 6 weeks it was found that he was unable to eat any of the cereals (wheat, corn, rice, oats and barley).

Follow up The child developed a persistent cough at the age of 18 months. Skin tests were negative but when the cough persisted and the child developed a nasal discharge he was re-examined. At this visit he was found to have eosinophiles in his nasal smear and a skin test was positive for *Alternaria*. He has been kept on *Alternaria* hyposensitization for the past year and has remained well. He has a permanent intolerance to wheat and corn.

Comment This case demonstrates how much the working out of an asthma problem depends on follow up. At first glance it appeared that milk was a factor but it happened that cereals were taken out at the same time as milk. It should be remembered that although milk is the great offender²⁰ in childhood food allergy, beans including soy beans are not infrequent sources of trouble (Fig. 2). If the infant had continued to have difficulty after a change to a soy milk meat base formula would have been indicated. A beef base formula is available commercially or it can be prepared as follows.^{21,22}

STRAINED MEAT FORMULA

Strained beef pork lamb chicken	1 cup
Corn oil	3½ tablespoon
Granulated sugar	2 tablespoon
Tapioca starch or flour	2½ tablespoon
Calcium carbonate (buy 4 oz)	1 teaspoon
Table salt (not iodized)	1 teaspoon
Water	1 quart

Heat water in the top of a double boiler until the water in the outer boiler starts boiling. Add the salt, sugar and calcium carbonate. Mix the starch to a paste in 1/3 cup of water and stir into the water in the top of the double boiler. Cook mixture for 10 minutes stirring constantly. Then add the strained meat and oil. Mix thoroughly and cook ten more minutes.

Chapter 6

TREATMENT OF THE ASTHMATIC ATTACK

GENERAL MANAGEMENT

A child in an attack of asthma represents much more than a problem of simple bronchial obstruction. He is often dehydrated and weary; he may be ill with infection and he is almost certainly very much afraid. It is well for the physician to proceed on the assumption that all these factors are present or impending and to give direct attention to each. If he proceeds to do so in an optimistic and confident manner, the child and his parents will sense that relief is in sight and the aura of anxiety surrounding the case will greatly diminish.

When first seen, the young patient will often be found to be breathing rapidly and jerkily. This type of respiration represents the hyperventilation of fear and the child's first need is gentle reassurance. The writer has found the following maneuver useful. The child is asked to watch the doctor who then proceeds to breathe slowly and not too deeply with plenty of time for expiration. He is directed to breathe in this more deliberate way and to take plenty of time in emptying his lungs. The slower rate is more efficient and by avoiding deep inspiration the child avoids the trapping of air resultant emphysema. The child is then ready for therapy directed toward relieving the obstructed airway.

Whether the patient is treated at home in the hos

pital, or in the doctor's office, he is placed at rest in a quiet place. Such sources of inhalant allergy or irritation as tobacco smoke, house dust, menthol and camphor fumes from vaporizers, etc., are eliminated. Hot liquids like tea and broth usually have a relaxing effect, and if the child is not vomiting these are to be encouraged. Common allergens such as milk, chocolate, aspirin-cola drinks, and egg are best withheld even though they are not known offenders in the particular case. The very fact that the child is in an attack is presumptive evidence that all factors have not been identified. An enemata often is beneficial perhaps because it removes intestinal gas which may interfere with contraction of the diaphragm.

DRUGS

Epinephrine

The dose of epinephrine for a 150 pound man is 0.5 cc., and hence it is proper to give 0.10 cc. for each 30 pounds of body weight. This should, in fact, be considered the maximum dose and often half or two thirds as much is fully as effective. By using smaller doses the physician is free to repeat injections as often as every 20 to 30 minutes for two to four injections. So as to allow for precisely accurate dosage, a tuberculin syringe is used for administration and the use of a 26 needle will almost entirely obviate pain. The home administration by a member of the family is recommended by Bowen,⁸ frowned on by Segal.⁹ The writer has found this practice wise in an occasional case. Most patients have a nurse neighbor who will be glad to accommodate in the task. It is not a bad plan to give the patient a note or card on which his dose is written. This will allow administration by an emergency room house physician without the danger of over dosage.

It is important that overdosage be avoided as in improper doses there is likely to be very distressing tachycardia and tremor.

Aminophylline

The physician will have no trouble remembering how much epinephrine and aminophylline to give a child if he remembers that the adult dose of 1:1000 aqueous epinephrine is 0.5 cc and the adult dose of aminophylline is 0.5 gm. Here however the resemblance ends. Epinephrine is given subcutaneously and may be repeated rather frequently while aminophylline is best given intravenously or rectally and must not be repeated at frequent intervals. The physician who has given aminophylline intramuscularly is not likely to do so again as the pain is intense. It is poorly absorbed when given by mouth but is used occasionally for minor symptoms. Intravenous administration must be slow.

Like epinephrine aminophylline in overdosage is dangerous and it is well to adhere to the dosage of 100 mg. to each 30 pounds of body weight. It must also be remembered that the drug has a cumulative action and it is wise to space dosage at 12 hour intervals.

Other Drugs

Ephedrine Although very useful for minor asthmatic symptoms ephedrine has little if any place in a severe attack. It is not effective in severe asthma and it may lead to numerous unpleasant side effects particularly excitement, sweats and indigestion. Levin has mentioned its occasional tendency to produce depression. It may be given alone or in combination with aminophylline and histaminics or barbiturates. The adult dose is 25 mg.

Iodides Potassium iodide occasionally finds use as an

expectorant It probably is most useful following the more severe stages of the attack. The dose recommended by Overall¹⁰ is three daily doses of the saturated solution of potassium iodide each dose equaling in drops the age in years.

Sedatives It is the writer's feeling that the only sedative needed in asthma is the comforting presence of solicitous adults. The child needs an awareness of what is going on so that he may understand and cooperate. The barbiturates are more likely to excite than calm him and if the physician sees the need of sedation he may use Bena-dryl or chloral. Morphine is the most dangerous of all drugs which have been used to bring rest in asthma being a respiratory depressant.¹¹ The writer has not used atarectic (tranquilizing) drugs since seeing one of his asthma patients develop severe shock after rectal chlorpromazine.

TABLE OF DRUGS USED IN ASTHMA

Drug	Dose 10 lb Child	Frequency
Epinephrine 1:1000	0.10 cc subcut	q 20-30 min for 3 or 4 doses
Aminophylline SS KI	0.1 gm I V 5 drops by mouth	q 12 hr as long as needed t i d as long as needed
Ephedrine	5 mg by mouth	q 4 hr p r n
Cortisone	25-75 mg by mouth	q 1 d 4 or 5 days
ACTH Gel	10-40 units I V	daily 4 or 5 days

DEHYDRATION

Since persistent vomiting is a regular complication of severe asthma, dehydration and acidosis must often be given serious consideration. Many times the "toxic" appearance of the patient depends more on dehydration and fatigue than on the asthma itself, and fluids may be the child's greatest need. As Levin¹² has pointed out, the dehydrated child may have diminished glycogen stores, and since chlorides are depleted by vomiting, the appropriate

solution for routine use would appear to be 5 per cent dextrose in saline or Ringer's lactate solution. Segal⁷ reports excellent results with plasma in patients with severe peripheral vascular collapse. Since aminophylline must be given slowly an intravenous infusion makes an ideal vehicle for this drug.

INFECTION

Infection is a common and treacherous problem in asthmatic attacks especially in infants. It may be the precipitating factor, a complication or a little of both. At times especially in young children what appears to be asthma may turn out to be bronchiolitis or bronchopneumonia. Since exact differential diagnosis may be impossible antibiotics should not be withheld.

STATUS ASTHMATICUS

In asthma of young children failure to respond to treatment usually indicates that infection is present but in older children uncomplicated asthma may prove resistant and the term status asthmaticus is properly applied. The real basis for success in these cases is proper application of the measures already discussed but at times other treatment is indicated.

Oxygen. When it is seen that an attack of asthma is likely to be severe or prolonged oxygen will often greatly relieve the tiring patient. This is especially true in infants and if given in a Croupette the combination of oxygen and cold steam is often dramatically effective. The addition of carbon dioxide 5 per cent seems to be of value as the gas is both an expectorant and respiratory stimulant. Segal⁸ recommends that continuous oxygen not be used longer than 18 hours.

Gamma Globulin. Bowen⁹ has recommended the use

of gamma globulin in resistant asthma in doses of 5 cc every month. Although there is no evidence of lack in gamma globulin in allergy, many asthmatic children seem to respond to this treatment.

ACTH and Cortisone It is always comforting to have something in reserve in the management of a disease which may at times become very severe, and ACTH and the adrenocortical steroids fill this need. Unfortunately they are widely used in lieu of specific treatment, a role for which they are poorly adapted. They are limited not alone in efficacy, but in safety, and current thinking may be summarized in this statement of Levin.¹⁰ Treatment with these hormones is never a substitute for thorough allergic study and search for specific etiologic factors with subsequent specific avoidance or desensitization. For this reason we limit the use of these drugs to short term therapy of 3 to 5 days for acute asthmatic episodes when the measures already outlined have not been successful in terminating an attack. He finds ACTH gel the agent most likely to give prompt relief, and recommends the following dosage for a child of 5 years:

1st day	20-40 units
2nd day	20 units
3rd day	10-20 units
4th day	10 units if necessary
5th day	10 units if necessary

In a recent paper, Rackemann¹¹ states that the steroids cannot replace more simple and less dangerous drugs, and adds that once started they are hard to stop. In speaking of prednisone and prednisolone he says that their total effect, both good and bad, is not very different from hydrocortisone.

WHAT NOT TO DO IN ASTHMATIC ATTACKS

A few prohibitions that have been found useful in

teaching are these

- (1) Never use morphine
- (2) Use the smallest effective dose of all drugs
- (3) Do not use *Coke* syrup to control vomiting in allergic children
- (4) A calm manner on the part of attending adults is the best sedative
- (5) Penicillin allergy is common in adults unusual in children rare in infants When in doubt as to infection in infants penicillin should be given but if there is no reasonably good indication in older patients do not use it
- (6) Don't criticize the parents if their failure to follow directions brought on an attack The allergist who is patient and tolerant in his dealings with the family will find the family patient and tolerant with him
- (7) Don't overlook dehydration

Chapter 7

SPECIFIC TREATMENT

The treatment of the asthmatic attack as discussed in the last chapter is non specific and should be part of the therapeutic equipment of every physician who treats children. In this chapter we will be concerned with specific allergic treatment a type of therapy in which the physician who undertakes the permanent relief of the disease must be proficient.

The specific treatment of asthma is divided into two phases *avoidance* and *hyposensitization*. Where complete avoidance is possible (as in foods and certain inhalants) no other treatment is required. Where inhalant avoidance is impossible (as in pollen, house dust, and mold allergy) hyposensitization is indicated.

AVOIDANCE OF INHALANTS

Avoidance of Atmospheric Inhalants The allergic individual is to a large extent at the mercy of atmospheric inhalants, and unless he is able to retire to a climate devoid of the guilty pollens and spores, the best that he can hope for is partial avoidance. At times it is practical for an individual to move from an area where a particularly toxic pollen such as ragweed is prevalent, but it must be kept in mind that he may very well develop a sensitivity to another pollen in his new home. Even if it were commonly successful, the practice of children being moved to an area where counts of all pollens are low has the serious

disadvantage that the child is from then on a prisoner of climate and may not in adult life be free to live where he wishes.

Even when being hyposensitized the patient with allergy to pollens and molds should not expose himself to any greater concentration of the offending antigen than necessary. Remaining indoors is of considerable help to such patients and where efficient air conditioning is available this is quite practical if it does not too greatly limit the patient's duties and recreation. The child who sleeps in relatively pollen and mold free bedrooms and spends some of his daytime hours indoors will better tolerate the load of antigen he must contend with at other times.

Avoidance of Household and Other Environmental Inhalants. The writer keeps a copy of the picture shown in Figure 12 hanging in his offices and clinics. This cartoon was designed to demonstrate clearly to patients and families the sources of environmental inhalants. It will be seen that sources of house dust, molds and other allergens and primary respiratory irritants are illustrated. In the basement are seen wet moldy walls, soap powder, sawdust, moldy and dusty papers (picked up by children in paper drives). An old style furnace with its cold air shaft and heat pipes is shown so that the parents may see how it should be kept clean. In the room above are shown the dust forming mattress, stuffed toy pillow and stuffed furniture. Various dust catchers are shown including shelves, drapes, cornices, books and rugs. Primary irritants illustrated are paint, perfume, ammonia, insecticides, etc. Other antigens included are dog, cat, feathers, pyrethrum, tobacco smoke, kapok, cotton seed and cattle hair, rug pad. Hanging on the wall is a farm scene in which are illustrated horse and cattle and such sources of mold as straw, hay, barns, chicken houses, etc. This illustration



Figure 12 Common Household Inhalants For discussion see text

has been found useful in indoctrinating families in the mysteries of inhalant allergy and is kept hanging in plain view as a reminder of the importance of continued vigilance in avoidance.

AVOIDANCE OF FOOD ALLERGENS

As in inhalant allergy avoidance of food allergens is a part of both treatment and prophylaxis. When a food has been identified as a definite allergen it is good practice to order its complete removal from the diet for one month. As Rinkel¹⁰ has found abstinence from a food tends to increase tolerance and after a month some children can tolerate the food every 4 or 5 days. If tolerance has not been gained the fact is quite obvious to the parents and often to the child and the food will be recognized as a food for which the child has permanent intolerance.

The duty of the allergist extends to the avoidance of future sensitizations. Our knowledge of the biological relationship of foods teaches us to encourage caution in allowing a patient to eat foods closely related to those to which he is sensitive. For example, the child found sensitive to corn is well advised to avoid excessive use of other grains. It is also well to caution against the excessive use of foods and drugs which seem antigenic by nature such as chocolate, citrus fruits, egg, fish, nuts, aspirin and penicillin.

HYPOSENSITIZATION

Theoretically the degree of clinical sensitivity to any inhalant allergen may be reduced by the parenteral administration of extracts of the offending substance. In practice this procedure is largely limited to house dust, molds and pollens but it is of occasional use in other in

halants such as dog hair. Physicians beginning to work with allergic people are commonly confused by discussion of low dosage, high dosage, titration, etc. As to dosage and serial dilution tests or titrations, most allergists will agree with Peshkin² in believing such tests have not been shown to rest on fundamental and scientific evidence and serve only to add confusion and false assurance. In any event, the way of knowing when the patient is sufficiently hyposensitized depends on the clinical experience with treatment of the patient in his particular environment.

In practice most allergists begin with a dose which is low enough to be safe, and proceed with caution to reach 'maximum tolerated dosage within the bounds of comfort and safety for the patient.' " As Withers once pointed out to the writer, the patient who has constitutional reactions may have no positive skin reactions at all. The writer once attempted hyposensitization in the case of a dental assistant with a positive ragweed history and a completely negative skin test. Even with the most extreme dilutions the patient produced frightening constitutional reactions.

Preparation of Treatment Set

There is a great deal of variety in the methods of preparing extracts for use in hyposensitization. To avoid confusion, the writer will present only his own method but those interested in other techniques including those involving preparation of concentrates from crude materials may consult one of the standard textbooks of allergy.

The *pollen* extracts used are the standard 1:10 concentrates obtainable through firms marketing allergic extracts. The *mold* extracts are "Type 33," developed by the Association of Allergists for Mycological Investigation and obtainable from the Hollister Stier Company. The house

TABLE III
DILUTION OF ALLERGEN EXTRACTS

1 Pollens (1:10)

To 1 cc of concentrate add 9 cc saline This is 1:100

To 1 cc of 1:100 add 4 cc saline This is 1:500

To 1 cc of 1:500 add 4 cc saline This is 1:2,500

To 1 cc of 1:2,500 add 4 cc saline This is 1:12,500

2 Type 33 Molds (1:100)

To 1 cc of concentrate add 9 cc saline This is 1:1,000

To 1 cc of 1:1,000 add 4 cc saline This is 1:5,000

To 1 cc of 1:5,000 add 4 cc saline This is 1:25,000

To 1 cc of 1:25,000 add 4 cc saline This is 1:125,000

3 Efron Horse Dust (1:40)

To 0.1 cc of concentrate add 9.9 cc saline This is 1:4,000

To 1 cc of 1:4,000 add 4 cc saline This is 1:20,000

To 1 cc of 20,000 add 4 cc saline This is 1:100,000

To 1 cc of 100,000 add 4 cc saline This is 1:500,000

dust concentrate is that developed by Efron and obtainable from the Endo Company

The strongest dilutions used in our offices and clinics are pollens 1:100 Type 33 molds 1:1,000 and Efron dust 1:4,000. The writer has not found stronger dilutions of advantage although children can usually tolerate allergic extracts in the greatest concentration.

In Table III the method of diluting extracts is outlined. Diluting is done with a sterile syringe and the diluting extract is ordinary buffered saline. The individual doing the diluting should be in a room to himself so

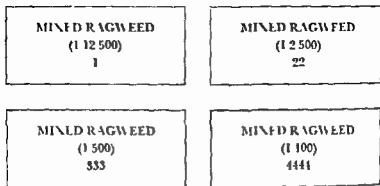


Figure 13 Labeling of Pollen Treatment Set

that there is no chance of a mistake being made because of distraction or interruption. It is important that the vials be labeled carefully and since treatment may be given not only by the allergist, but by his assistants referring doctors, other doctors, assistants, etc., it is wise to label the vials so that there is scarcely any chance of the dosage being misunderstood. Although the strongest dilution is the first dilution, it is not given first! It is our practice to label the vials according to when they are used and therefore the weakest is number 1. We use two further safeguards: we label the bottle with the actual strength and to give emphasis that bottle 4 is the strongest, four numerals are used. Three are used for bottle 3, two for bottle 2, and one for bottle 1. For example, a ragweed set is labeled as shown in Figure 13.

The bottles may be labeled according to any system that will make certain that the relative strengths of the dilutions will be understood by the least experienced individual into whose hands these potent extracts may fall. The method given here has proved practical and safe, but

Specific Treatment

any method which will make certain that there is no confusion in dosage may be used

Hyposensitization Schedule

Patients are begun on 0.03 cc of the weakest dilution and are treated with doses representing increases of approximately 50 per cent until a maintenance dose is reached (Table IV). This is usually 0.25 cc of the strongest dilution but if the child exhibits persistent intolerance (local or constitutional reaction) at a lower dose the usual maintenance dose is just below the dose which is not tolerated. Injections are best given twice weekly until control is achieved but where this is not practical they may be given weekly. When the maintenance level is reached the patient is treated once a week during the period when the antigen to which he is sensitive is active and every 3 to 4 weeks at other times. It is wise to cut the dose of potent pollens like ragweed and Russian thistle in half during the height of the season as full doses may cause reactions or accentuation of symptoms.

Precautions in Hyposensitization

Allergy extracts are potent agents and the physician needs to be familiar with their dangers. As all useful drugs are potent however he should not be afraid of them. An occasional patient reacts violently to injections and a knowledge of prevention and treatment of these reactions is very important. The causes of reactions are (1) over dosage and (2) accidental entry of a vein.

Local Reactions At the site of the injection there will often be more or less itching, a small wheal and mild erythema. This is not to be considered an untoward reaction. If an area of edema 2 cm. or more in diameter appears however this is to be considered a mild local re-

TABLE IV
TREATMENT SCHEDULE IN HYPOSENSITIZATION

<i>Bottle 1</i>	(1 12,500 pollen 1 12,000 Type 33 mold 1 100,000 Endo house dust)
1st dose	0.03 cc
2nd dose	0.05 cc
3rd dose	0.07 cc
4th dose	0.10 cc
5th dose	0.15 cc
6th dose	0.25 cc
<i>Bottle 22</i>	(1 2,500 pollen 1 2,000 Type 33 mold 1 100,000 Endo house dust)
7th dose	0.05 cc and work up to
11th dose	0.25 cc
<i>Bottle 333</i>	(1 500 pollen 1 5,000 Type 33 mold 1 20,000 Endo house dust)
12th dose	0.05 cc and work up to
16th dose	0.25 cc
<i>Bottle 444</i>	(1 100 pollen 1 1,000 Type 33 mold 1 4,000 Endo house dust)
17th dose	0.05 cc and work up to 0.25 cc top dose

Note In patients who cannot take the full dose of 0.25 cc of the strongest dilution the highest dose they can tolerate becomes the maintenance dose

action. In severe local reactions, the entire lateral aspect of the upper arm may swell.

Constitutional Reactions This alarming reaction, which is fortunately uncommon, may take several forms. The patient may develop asthma or there may be multiple areas of urticaria, itching under the chin and between the scapulae, sneezing, pallor, cold sweats and prostration. Coma and death are not unknown.

Prevention of Reactions To prevent reactions the physician attempts to avoid (1) exceeding tolerance (2)

accidental overdosage and (3) accidental entry of a vein

(1) *Avoiding Exceeding Tolerance* Especially if doses are being increased the patient or his parent is asked about any previous reaction After the injection the patient should remain in the vicinity of the office or clinic for about 20 minutes

(2) *Avoiding Accidental Overdosage* The old rule used in eye medication may be applied here Check dose and dilution before drawing in into syringe before injection and immediately after injection

(3) *Avoiding Accidental Entry of Vein* This accident should be carefully avoided The precaution of drawing back on the plunger of the syringe should be followed It is wise to use a 24 or 25 gauge needle as a smaller needle may not allow reflux of blood

It is a good practice to keep on hand a package of red adhesive stars to affix to the treatment record of any patient who has any type of untoward reaction Once a patient has had a treatment reaction of any type drop back to two or three steps below the point where the reaction occurred and increase thereafter with caution

Treatment of Reactions

Treatment is usually not necessary for local reactions but patients so reacting should be kept in the office for about 20 minutes to be certain they are not in an incipient constitutional reaction If there is doubt it is best to proceed as if a constitutional reaction is present

The patient having a constitutional reaction is made to lie down and a light tourniquet is placed above the site of the injection He is given epinephrine (aqueous 1:1000) 0.10 cc for each 30 pounds of body weight in the injection site and the same dose in the other arm An antihistaminic is given by mouth The patient is kept in

the office until recovered. Further treatment, if necessary, is given along the lines of management of the asthma attack, page 75.

How Long is Hyposensitization Continued?

There is no easy answer to this question. Generally speaking, mold and pollen treatment should be continued 1 full year after control is adequate. In the case of house dust, most patients become so careful in avoidance that 1 or 2 years of treatment are considered adequate. In poor environments, especially where asthma is severe, house dust treatment may have to be given indefinitely.

Chapter 8

MANAGEMENT OF PROBLEM CASES

In the management of childhood asthma as in such fields as orthopedics and orthodontia success depends to a large extent on efficient follow up. In most cases this involves little more than proper attention to standard allergic routine but in others it may be very difficult and tedious and these problem cases call for all possible skill and perseverance. This chapter will be devoted to the important sources of treatment failure and to the methods indicated for correction.

Failure in Family Cooperation

In spite of the most careful attention to family education there will be an occasional case where the parents are unable or unwilling to cooperate. At times as when the family is broken or a parent is mentally incompetent the physician may face an impossible situation but in the great majority of cases a relationship can be established which will make successful management of the case possible. It is well to remember that the family very likely has other problems besides the child's asthma problems perhaps of even greater importance.

It is seldom that a family will fail the physician when he makes it clear that he has a genuine interest not only in their child but in their problems in general. He is especially likely to be successful in winning their confidence if his fees do not impose an undue burden on the

family budget! Many allergists have found it wise to treat all asthma on the basis of a flat fee covering all services rendered during a stated period of time. This not only allows the parents to budget the allergy fee but encourages them to bring the child in often enough and long enough to insure proper control.

Incomplete Avoidance

Since avoidance is of the utmost importance in asthma it is necessary that the follow up include frequent checks of this phase of treatment. As the asthma becomes quiescent it is only natural that the child and those about him become lax in avoidance. It may be found that one child has been given a house pet because he didn't react to the skin test that another sensitive to egg has been eating a new and egg containing brand of ice cream or candy that another is using a feather pillow on top of his foam rubber pillow.

The more the allergist shares his understanding of allergy with mothers and the less he relies on involved prepared lists the better will allergens be avoided. The mother who really understands what is being avoided and why such restriction is necessary may be depended on to see to it that this important phase of treatment is successfully carried out.

Slow Response to Hyposensitization

Although some children respond to hyposensitization with remarkable promptness others respond very slowly. This is notably true in mold allergy especially in cases of long standing. In such cases the allergist is well advised to inform the parents in advance that although there should be constant improvement good control may be delayed for a year or so. Having the mother watch daily

fluctuations in the mold count is of great help in cases where results of mold treatment are slow. It helps her determine when outdoor activities need to be restricted and makes it possible for her to see increasing resistance to concentrations of spores which have in the past brought on severe asthma.

New Sensitivities

Although children with asthma are perfectly capable of developing new sensitivities at any time they are fortunately not especially inclined to do so. This is particularly true when the mother has been properly instructed in allergic prophylaxis. When however the youngster either fails to respond to treatment or relapses from adequate control the possibility of new sensitization is to be considered. Among inhalants pollens are especially likely to appear well after other allergens have been identified and controlled. At times a food which has not previously been eaten is introduced into the diet with resultant relapse. Among the many which may react in this way are chocolate, legumes, cinnamon, black pepper, food colors, shrimp, walnut, cottonseed meal, mint and strawberry.

Psychic Factors

Although allergists in general dissent from the theory of the psychogenic origin of asthma, unusual psychic stress is a recognized contributing factor in certain cases. A patient of the writer, a very allergic girl of 6 years whose father regularly expressed his frank hatred for her, was much relieved of asthma following his sudden death. Another little girl, also known to have widespread sensitivities, was openly rejected and neglected by both parents who were divorced shortly after the child was first seen. In her case there was a less obvious relationship between

her unhappy situation and her asthma, but certainly the broken home made impossible proper attention to her allergic needs

Whatever the role of psychic factors in asthma, the allergist is first of all a physician and will be certain to do all he can to free any of his young patients from the tragedy of an unhappy childhood. He must not, on the other hand, use the psychosomatic theory as a convenient excuse for his failures

Hidden Food Allergens

The problem in intractable asthma which is at once the most important and difficult is that of hidden or latent food allergies. It is a *difficult* problem because hidden food allergens may become manifest only when the child is under stress. It is an *important* problem because failure to recognize guilty foods is certain to lead to poor results if not outright failure. When the child is carrying a heavy load of inhalant allergy, or is under nonspecific stress as from infection or chilling, these subtle offenders become of the greatest possible significance.

At times the presence of hidden food allergens can be picked up by repeated individual eliminations. However, this has the disadvantage of being an extended process and the patience of the family (and the faith of the neighbors) is sorely tried. With the use of the following diet the writer has had excellent results. This diet called the 8 day diet because of its duration, eliminates all common offenders while rotating all others. A record of foods and symptoms is kept on a food diary sheet (Fig. 11). If asthmatic and other allergic symptoms clear remarkably during the 8 days of the diet, one of the foods which was completely eliminated is suspected. If he clears on certain days and flares on others, one of the foods or food families be

ing rotated is suspected. Many times at the end of the diet the child is relieved, but the cause is unknown. In this case, the rotation is continued and eliminated foods are returned to the diet in turn until the culprit is found. Often the diet cannot be used as shown because it contains known food allergens but it is not difficult to make substitutions.

The 8 day diet as given below includes the instructions given to the patient's mother.

EIGHT DAY DIET

This diet eliminates all common foods and rotates the rest.

You may cook with vegetable oil and shortening, sugar and salt. Although butter and oleo contain traces of milk, they can be used in moderation.

The child does not have to eat any particular food and since this is a very strict diet, it is wise to allow him to eat when he wants and as much as he wants.

Note on fruits: When a fruit is allowed, it must be either fresh, dietetic (water pack) or dried. It must not contain either food dye or corn syrup.

		First or Second Days
First Day	Beef (hamburger, breakfast beef, dried beef, roast, steak, etc.) Potato, potato chips Tomato, tomato juice	Banana, Cinger ile Beet, Spinach Dye, Tapioca Cucumber, pickles Lettuce, Cantaloupe Squash, Watermelon Cranberry, Currant Cherry, Rhubarb
Second Day	Lamb (ham, fresh pork, bacon, lard, etc.) Lamb Beans, peas, peanuts Apple, cider, apple vinegar Pear	
Third Day	Chicken (not hen) Grape, grape juice, raisin	Third or Fourth Days
Fourth Day	Fish (salmon, tuna, fresh fish, etc.) Onion Asparagus Plum, prune, peach, cherry Almond	Carrot, Celery Broccoli, Cabbage Cauliflower, Turnip Brussels sprouts Olive, Tea, Radish Parsnip, Sweet Potato Pineapple, Fig

After following this diet for four days the child repeats the same schedule for an additional four days. Keep a record of all foods, drinks and medicines taken during this period on the diet diary sheet. Also make note of any allergic symptoms that occur during the eight days.

Chapter 9

ALLERGIC COOKERY

The great majority of mothers faced with the task of restricting the diet of their allergic children quickly adjust to these restrictions and, even with little if any instruction, learn to prepare well balanced and palatable diets. However, they will learn to do so much more quickly and satisfactorily if they start with certain fundamentals of food avoidance and substitution which have been learned by others. It is the purpose of this chapter to outline these fundamentals. A few recipes will be given all of which have been brought in by mothers who have actually put them into use, but for the most part discussion will be devoted to fundamentals and basic principles. These will be discussed according to the food to be avoided.

MILK-FREE DIETS

Since cow's milk is a universal food in infants and children, milk substitution is a real problem. In infants the most practical solution is the use of one of the soy milks'. The product with which the writer has had the most experience is Mullsoy®. It is palatable, and numerous reports have shown it to be equal to cow's milk nutritionally.

In older children unable to take milk, the intake of animal protein should be high, and the eating of meat, fowl, egg, and fish is encouraged. Useful calcium supplements are Calcets (Walker), Syrup of Neocalglucon

(Sandoz), calcium lactate, calcium wafers, or even calcium carbonate powder

Since children almost always are very fond of ice cream and other frozen desserts, most mothers of children with milk allergy are glad to know of ways of making substitutes. Delicious ices may be made with fruit pulps and juices. Soy milks or the coffee cream substitute Mocha Mix* may be used as a base for ice cream. The latter is also useful as a substitute for milk on cereals, but it must be pointed out that unlike soy milks it does not have the nutritional value of cow's milk.

Raspberry Ice

1 package raspberry flavored gelatine

½ cup sugar

1½ cups hot water

¼ cup lemon juice

2 packages frozen raspberries thawed sieved

(Other fruits and gelatine flavors may be used)

Dissolve gelatine and sugar in hot water and cool. Add lemon juice and fruit, pour into refrigerator tray, freeze. Break up, beat smooth and refreeze 3 hours.

In cooking, most mothers find it best to learn to cook without creaming foods, using water in gravies and sauces. Vegetables may be buttered in most cases, as creamery butter contains very little milk protein.

EGG-FREE DIETS

Egg is used in cooking for its flavor, binding qualities and (by trapping air in whipping) as a leavening agent. It also makes baked goods lighter and moister. There is no efficient substitute for egg in cooking, but by exercising sufficient ingenuity, the mother can do very well without it. By local inquiry, ice creams and sherbets can be found which are made without egg. Most children are very fond of canned noodle soup which contains egg.

*Aerated Products 2714 Cherry Kansas City Mo

noodles and probably hen, but mothers can make their own noodle soup with egg free noodles and friers

It is in baking that a knowledge of egg substitutes is especially valuable. Since even the baking powder may contain egg, the mother is directed to use either KC Dr Price's, or Royal baking powders. Fruit pulp is useful as a moistening and binding agent.

Wacky Cake

Start heating oven to 350°

Sift together 1½ cups sifted all purpose flour ¼ tsp salt ½ tbsp cocoa 1 tsp baking soda and 1 cup sugar. Make 3 holes in ingredients in first hole put 1 tsp vinegar in second 1 tsp pure vanilla extract in third 5 tbsp salad oil. Over whole thing pour 1 cup water. Mix well. Bake 30 min or until tester comes out clean. This cake is mixed in the same pan in which it is baked.

Eggless Cake

¾ cups cake flour

2 tsp egg free baking powder

¼ tsp salt

1/3 cup shortening

1 cup sugar

¼ cup Mocha Mix (or water)

1 tsp vanilla

Sift flour once add baking powder and salt. Sift again. Cream sugar and shortening. Add flour mixture and Mocha Mix and beat well.

Bake in two 8 inch cake pans or loaf pans. Set oven at 375° and bake 20 minutes.

(1 mashed banana or a pinch of soda may be added.)

Chinese Almond Cookies

2 cups flour

¾ cup sugar

1 tsp almond extract

1 cup shortening at least half butter or oleo

Mix shortening and flavor thoroughly

Add flour and sugar

Knead until rolls

Slice. Bake at 350° 10 minutes

CORN FREE DIETS

The chief problem in corn allergy is the avoidance of corn syrup often one of the worst corn offenders. Since corn starch is not widely used in commercial foods or in home cooking it is not a major problem and most allergists feel that corn oil and corn sugar are not antigenic. Sugar, honey, brown sugar and maple sugar (and syrup) can be used where fruits, desserts, candies and baked goods are to be sweetened. Children who get hungry for popcorn may be given peanuts (or other nuts as tolerated), salted non corn breakfast cereals, various crackers, potato chips and pretzels.

WHEAT FREE DIETS

Nothing is more exacting than the avoidance of wheat and since wheat owes its excellent baking qualities to gluten, other flours are far from satisfactory. Two rye products, Ry Krisp and canned rye bread are taken well by many children, especially if they are toasted. Flours used in place of wheat flour are tapioca flour, soy flour, arrowroot flour and potato flour. Because of their close biological relation to wheat, flours made from grains such as corn, rice, oat and rye, although not forbidden, are not to be encouraged for general use.

Peanut Butter Cookies (Contain no grains)

- ½ cup brown sugar
- ½ cup sugar
- ½ cup vegetable shortening
- ½ cup peanut butter
- 1 cup tapioca flour
- 1 egg, beaten
- ½ tsp. soda
- ¼ tsp. vanilla
- ½ tsp. salt

Bake 1 to 15 minutes at 400

Makes about 2 or 3 dozen

Macaroons

(Contains no grains)

Beat until stiff $\frac{1}{2}$ cup egg white Beat in $1\frac{1}{4}$ cup sugar $\frac{1}{4}$ tsp

salt $\frac{1}{8}$ tsp vanilla and 1 cup broken nut meats not too fine

Drop ro in 1 in tsp 2 inches apart on ungreased wrapping paper

or baking sheet Bake until set and delicately brown Count

$2\frac{1}{2}$ cups may be used in place of nuts

TOMATO FREE DIETS

Although tomato is widely used in cooking it is surprising how easily it may be avoided For example a delicious combination salad may be made with lettuce carrot cauliflower pepper radish celery and other raw vegetables plus an appropriate salad dressing Soups chili and stews will be found to lose little from the elimination of tomato In the making of chili sugar and vinegar supply much of the sour sweet character of tomato

CITRUS FREE DIETS

Children who cannot take citrus juices may use as substitutes grape juice pineapple juice tomato juice apricot nectar apple juice etc For eating between meals most children like grapes plums apples pears bananas and peaches Many children like raisins prunes and other dried fruits as is

FOOD DYE FREE DIETS

Children who must avoid food dyes and flavors must avoid pop Popsicles frankfurters Jello Koolade oleo colored ice cream and several other foods In place of colored carbonated drinks they can be given the clear mixers like ginger ale and white soda Gelatine desserts may be colored and flavored with fruit juices Sensitivity to food dyes does not necessarily extend to all colors Experience will show which of these must be avoided

MEAT-FREE DIETS

The child sensitive to pork may be given lamb patties, breakfast beef (in place of bacon), hamburger fish chicken, and egg. The child with beef allergy often takes pork steaks, lamb patties and chops and other meats very well. The child sensitive to fish may be able to eat shrimp and vice versa. Chicken allergy is rare, and when there is doubt as to the other meats it is very useful as a source of animal protein.

REFERENCES

- 1 Adriani J Anesthesia and allergy *Ann Allergy* 12 519 1954
- 2 Baker J Allergy in children as related to altitude *Ann Allergy* 6 33 1948
- 3 Balyeat R M and Rinkel H J Allergic migraine in children *Am J Dis Child* 42 1126 1951
- 4 Bedford P D Idiosyncrasy to aureomycin *British M J* 1 1405 1951
- 5 Bierly M Z Jr Considerations of special interest to the allergist on the composition of production of poliomyelitis vaccine *Ann Allergy* 14 349 1956
- 6 Black I Ravin N Putman M I Foreign body in respiratory tract simulating bronchial asthma *Ann Allergy* 11 46 1953
- 7 Bowen R Some practical suggestions in the management of asthmatic children *M Rec & Ann* 39 1189 1915
- 8 Bowen R The Achilles heel in allergy *South M J* 47 163 1954
- 9 Bowen R Gamma globulin and the asthmatic child *J Allergy* 26 87 1955
- 10 Briedahl H G Syndrome of cyclic attacks of allergy in childhood *M J Australia* 2 961 1950
- 11 Brier A J in Sampter M and Durham O C *Regional Allergy of the United States Canada Mexico and Cuba* Springfield Thomas 1955
- 12 Brown L A Drug allergy *Quart Rev Allergy & Applied Immunol* 7 51 1953
- 13 Brown L A and Columbo N J The asthmogenic effect of odors smells and fumes *Ann Allergy* 12 14 1954

- 11 Brown G T *Pollen Slide Studies* Springfield Thomas 1919
- 15 Buflum W P Asthma in infancy *Ann Allergy* 11 175 1953
- 16 Buflum W P The diagnosis of asthma in infants and children *AMA Am J Dis Child* 93 234 1957
- 17 Cazort A G and Johnston T G in Sumpter M and Durham O C *Regional Allergy of the United States Canada Mexico and Cuba* Springfield Thomas 1955
- 18 Chobot R *Pediatric Allergy* New York McGraw Hill 1951
- 19 Christensen C M and Swaebly M A in Sheldon J M Lovell R G Mathews K P *A Manual of Clinical Allergy* Philadelphia Saunders 1953
- 20 Clin N W Cow's milk allergy in infants *Pediat Clin North America* 1919 1951
- 21 Crump J Vaccine treatment in allergic respiratory conditions *Pediat Clin North America* 1937 1951
- 22 Curphey T J Fatal anaphylaxis in bronchial asthma following administration of penicillin two cases with autopsy findings *New York J Med* 53 1107 1953
- 23 Dermer W C in Ratner B *Allergy in Relation to Pediatrics* St Paul and Minneapolis Bruce 1951 p 169
- 24 Dees S C Development and course of asthma in children *AMA Am J Dis Child* 93 228 1957
- 25 Dees S C The use of aminophylline rectal suppositories in the treatment of bronchial asthma *J Allergy* 14 192 1953
- 26 Derbes V J Weaver N K and Cotton A L Complications of bronchial asthma *Am J Med Sc* 222 88 1951
- 27 Durham O C and McKay F L in Sheldon J M Lovell R G Mathews K P *A Manual of Clinical Allergy* Philadelphia Saunders 1953
- 28 Editorial *J Allergy*, 24 187, 1953
- 29 Field C E Bronchiectasis in children clinical survey of 160 cases *Pediatrics* 1 21 1919

- 30 Feingold B F The influence of infection on the course of allergy in children *J Pediat* 34 545 1949
- 31 Fineman H A The pressure test as an aid in the clinical diagnosis of bronchial asthma *M J & Rec*, 135 425 1932
- 32 Foreign Letters England Sulfur chief cause of fog deaths *JAMA* 156 785 1954
- 33 Glaser J Migraine in pediatric practice Observations with special reference to migraine of allergic origin *AMA Am J Dis Child* 88 92 1954
- 34 Glaser J *Allergy in Childhood* Springfield Thomas 1956
- 35 Halpern S R and Halpern D Reactions from dpt immunization and its relationship to allergic children *J Pediat* 47 60 1955
- 36 Hansel F K *Clinical Allergy* St Louis Mosby 1953
- 37 Hansen Pruess O C Arsenic in the treatment of asthma *Ann Allergy* 13 1 1955
- 38 Harris C J and Shure M Sudden death due to allergy tests *J Allergy* 21 208 1950
- 39 Horeish A J Allergy to odor of white potato (Irish potato) *J Allergy* 15 147 1944
- 40 Levin S J Management of the acute asthmatic attack in childhood *Pediat Clin North America* 1 975 1954
- 41 Loveless M H and Fackler W R Wasp venom and immunity *Ann Allergy* 14 347 1956
- 42 MacQuiddy E L in Sampter M and Durham O C *Regional Allergy of the United States Canada Mexico and Cuba* Springfield Thomas 1953
- 43 Markow H and Reicher J The effect of meteorologic conditions on asthma patients *New York J Med* 53 2675 1953
- 44 Matheson A and Elegant L Penicillin reactions in children *J Allergy* 26 115 1955
- 45 Mivum C K Sighing dyspnea a clinical syndrome *J Allergy* 10 50 1938

- 16 Morrison I H An instrument devised to produce painless scratches *Ann Allergy* 8 679 1950
- 17 Mueller H L Dosage in the treatment of pollinosis *Pediat Clin North America* 1 1039 1954
- 18 Mueller H I and Hill L W Allergic reactions to bee and wasp stings *New England J Med* 249 726 1953
- 19 Nance I D Asthma in the newborn or doctor in the thymus? *Hawaii M J* 6 100 1947
- 20 O Byrne G T Loeffler's syndrome—Report of a case in an infant *Texas State J Med* 43 446 1947
- 21 O Keefe L B in Ratner B *Allergy in Relation to Pediatrics* St Paul and Minneapolis Bruce 1951 p 169
- 22 O Keefe E S Protein sensitivity in children with negative cutaneous reactions *JAMA* 80 1120 1923
- 23 Overall M C The symptomatic treatment of asthma *JAMA Am J Dis Child* 93 240 1957
- 24 Pascher F and Wolf J Cutaneous sequelae following treatment of bronchial asthma with inorganic arsenic *JAMA* 148 734 1932
- 25 Perlman F in Simpler M and Durham O C *Regional Allergy of the United States Canada Mexico and Cuba* Springfield Thomas 1935
- 26 Peshkin M M Asthma in children I Etiology *Am J Dis Child* 31 763 1926
- 27 Peshkin M M Pitfalls of the skin tests in allergy *JAMA*, 157 820 1955
- 28 Prickman L E and Buchenstein H F Hypersensitivity to acetylsalicylic acid (aspirin) *JAMA* 108 445 1937
- 29 Prince H L and Morrow M R Mold fungi in the etiology of respiratory allergic diseases XV Selection of molds for therapy *Ann Allergy* 12 253 1954
- 30 Prince H E Miscellaneous inhalants and molds *Ann Allergy* 9 575 1951
- 31 Prince H E and Morrow M B Mold fungi in the etiology of respiratory allergic diseases XV Selection

- of molds for treatment *Ann Allergy*, 14 253, 1954
- 62 Prince, H E., Kaplan, M A., Morrow, M B Fungi and bacteria in the etiology of respiratory allergic diseases XVII Comparison of allergenicity of a sporulating and a nonsporulating *Alternaria* *Ann Allergy*, 14 15, 1956
- 63 Rackemann, F M The management of asthma *M Clin North America*, Sept., 1956, p 1305
- 64 Randolph, T G The descriptive features of food addiction *Quar J Stud Alcohol*, 17 198 1956
- 65 Randolph T G and Rawling, F A Bronchial asthma as a manifestation of sulfonamide sensitivity *JAMA*, 126 166 1944
- 66 Ratner, B Asthma in children *JAMA*, 142 538, 1950
- 67 Ratner B General management of allergic children *Pediat Clin North America*, 1 943, 1954
- 68 Rinkel H J Randolph T G and Zeller, M *Food Allergy* Springfield Thomas 1951
- 69 Rinkel H J Thermal allergy Clinical evaluation and management *South M J*, 44 1067 1951
- 70 Rosen F T Levy A Bronchial asthma due to tobacco smoke in an infant *JAMA*, 144 620 1950
- 71 Rosenthal A Eight fatal anaphylactic reactions to penicillin *New York State M J*, 54 1485, 1954
- 72 Rounds, V J Aminophylline poisoning *Pediatrics* 14 528, 1954
- 73 Rowe, A H Fever due to food allergy *Ann Allergy*, 6 219, 1948
- 74 Rowe, A H, and Rowe, A, Jr Allergy and infection, in Correspondence *JAMA*, 154 568 1951
- 75 Rowe A Jr, and Rowe, A H Strained meat formulas in allergic disease of infants and children *California Med* 181 279, 1954
- 76 Sympter, M, and Durham, O C *Regional Allergy of the United States, Canada, Mexico, and Cuba* Spring

field, Thomas, 1955.

- 77 Schaffer, N., and Seidmon, E. P. Mold content of air, clinical aspects *J. M. Soc. New Jersey*, 51 68, 1954
- 78 Segal, M. S. *Severe Bronchial Asthma* Springfield Thomas, 1950
- 79 Sheldon, J. M., and Lovell, R. G. Asthma due to halo gens *Am. Pract.*, 4 43, 1949
- 80 Sherman, W. B. Drug allergy *Am. J. Med.*, 3 509, 1947
- 81 Silver, A. S., and Wainman, P. L. Chronic arsenic poisoning following use of asthma remedy containing Fowler's solution, (potassium arsenite) *J. A. M. A.* 152 922, 1952
- 82 Sobel, G. Adenotonsillectomy and its relation to asthma *Ann. Allergy* 11 583, 1953
- 83 Speer, F. The allergic tension fatigue syndrome *Pediat. Clin. North America* 1 1029, 1954
- 84 Swineford, O., Jr., and Weaver, W. M. History taking in allergy *Ann. Int. Med.*, 20 293, 1944
- 85 Swineford, O., Jr. Don't do this in allergy *Ann. Int. Med.*, 20 293, 1953
- 86 Swinney, B. Severe reactions from insect stings *Texas J. Med.*, 46 639, 1950
- 87 Unger, L. *Bronchial Asthma* Springfield, Thomas, 1915
- 88 Urbach, L. Analysis of 152 ward cases of asthma *Internat. Clin.*, 4 89, 1940
- 89 Vaughan, W. T. Food allergens I. A genetic classification with results of group testing *J. Allergy*, 1 385, 1930
- 90 Vaughan, W. T., and Pipes, D. M. Correlation between food dislikes and food allergy *J. Allergy*, 8 257, 1937
- 91 Waterhouse, A. T. Bee stings and anaphylaxis *Lancet*, 2 946, 1911
- 92 Wiseman, J. R., and McCarthy Brough, M. P. Skin sensitivity in the aged fatality following intracutaneous tests *J. Allergy*, 16 250, 1945
- 93 Withers, O. R. Food allergens, a statistical study of 43 cases relative to the genetic classification of foods *South*

- M J 50 918 1937
- 94 Wittich F W Respiratory tract allergic effects from chemical air pollution *Arch Indust & Occup Med* 2 239 1950
- 95 Wodehouse R P *Hay Fever Plants* Waltham Chronica Botanica Co 1945
- 96 Wodehouse R P *Pollen Grains* New York McGraw Hill 1935

field Thomas 1955

- 77 Schaffer N and Seidmon E P Mold content of air clinical aspects *J M Soc New Jersey* 51 68 1954
- 78 Segal M S *Severe Bronchial Asthma* Springfield Thomas 1950
- 79 Sheldon J M and Lovell R G Asthma due to halogens *Am Pract* 4 43 1949
- 80 Sherman W B Drug allergy *Am J Med* 3 509 1947
- 81 Silver A S and Wainman P I Chronic arsenic poisoning following use of asthma remedy containing Fowler's solution (potassium arsenite) *JAMA* 157 322 1952
- 82 Sobel G Adenotonsillectomy and its relation to asthma *Ann Allergy* 11 583 1953
- 83 Speer F The allergic tension fatigue syndrome *Pediat Clin North America* 1 1029 1954
- 84 Swineford O Jr and Weaver W M History taking in allergy *Ann Int Med* 20 293 1944
- 85 Swineford O Jr Don't do this in allergy *Ann Int Med* 20 293 1953
- 86 Swinney B Severe reactions from insect stings *Texas J Med* 46 639 1950
- 87 Unger L *Bronchial Asthma* Springfield Thomas 1945
- 88 Urbach L Analysis of 152 ward cases of asthma *Internat Clin* 4 89 1940
- 89 Vaughan W T Food allergens 1 A genetic classification with results of group testing *J Allergy* 1 385 1930
- 90 Vaughan W T and Pipes D M Correlation between food dislikes and food allergy *J Allergy* 8 257 1937
- 91 Waterhouse A T Bee stings and anaphylaxis *Lancet* 2 946 1914
- 92 Wiseman J R and McCarthy Brough M P Skin sensitivity in the aged fatality following intracutaneous tests *J Allergy* 16 250 1945
- 93 Withers O R Food allergens a statistical study of 43 cases relative to the genetic classification of foods *South*

INDEX

A

- Abdomen
 - distension 16
 - pain 15
- Acetylsalicylic acid 45 47
- ACTH 80
- Adrenalin 76
- Air conditioners 83
- Air studies 30 36
- Allergens
 - food 42 46 62
 - inhalant 21 41
- Allergic cookery 99
- Alternaria* 23 28 37
- Altitude 52
- Amaranthus 26 38
- Ambrosia* 24 38
- Ammonophylline 77 79
- Angioedema 14
- Animal emanations 99 61
- Aphthae 16
- Artemisia* 25 38
- Aspirin 45 47
- Asthma attack 7 75
 - treatment 73 80
 - what not to do 80
- Asthma
 - cardiac 20
 - clinical picture 7
 - cyclic 11
 - definition 3
 - diagnosis 7 18

- etiology 21 52
- mode of onset 8
- physical findings 8
- thymic 19
- treatment of attack 75 81
- treatment specific 82 98

Atmospheric studies 30 36

Avoidance

- failure in 94
- food 85
- inhalant 82 85

B

- Beer 29
- Behaviour 14
- Bloating 16
- Blood in asthma 17
- Bronchiectasis 19
- Bronchiolitis 18
- Bronchitis asthmatic 18
- Bronchopneumonia 18
- Bronchus foreign body 18
- Burning bush 25
- Burweed marsh elder 21

C

- Calendar pollen mold 33 45
- Cannabis* 27 38
- Canker sores 16
- Cardiac asthma 20
- Case studies 65 71
- Cat hair 39
- Cattle hair ■

Cedar mountain 26 33
 Chenopods 23
 Chest deformity 8 9
 Chilling 10 51
 Chocolate 22 23 43
 Citrus fruits 103
 Climate 51
 Clinical picture 7
 Cocklebur 21
 Cola 22 43 81
 Colds 12 49
 Color food 43 103
 Compositae 24
 Constipation 15
 Constitutional allergy 11 54
 Convulsions 13
 Cookery allergic 99
 Corn 102
 Corticotropin 80
 Cortisone 80
 Cottonseed 40
 Croup 19
 Cutaneous test 58
 Cyclic vomiting 15

D

Dehydration 78
 Dermatoses allergic 13
 Desensitization 83
 Diagnosis
 asthma 7
 differential 18
 etiologic 53
 Diarrhea 15
 Diet
 diary 66 96
 eight day 96
 elimination 64 96
 Dog hair 39 61
 Drugs
 as allergens 43
 in treatment 76
 Dust house 36 83 86

Dye food 45 103
 Dyspnea sighing 40

E

Eczema 13
 Education family 5 83
 Egg 45 100
 Elm 26 38
 Emotional factors 5 29
 Emphysema 8
 Emetics 17
 Eosinophilia
 blood 17
 nasal 13
 Ephedrine 77
 Epinephrine 76
 Epithelials 39
 Etiologic diagnosis 53 74
 Etiology of asthma 21 52
 Extracts preparation 86

F

Facies allergic 17
 Family of asthmatic child 43 81
 93
 Fatigue allergic 14
 Feathers 39
 Feto-orn 16
 Fever allergic 17
 Flatulence 16
 Foods 42 62 99
 antipathy to 63
 avoidance 83 99
 craving 63
 dislikes 63
 dyes 103
 families 43
 hidden allergens 96
 important 22 23 42
 preparation 99
 skin tests 61 63
 sources 46
 tolerance 81
 Foreign body in bronchus 18

Foul breath 16
Fungi 28 30 37 43

G

Gamma globulin 79
Gastrointestinal allergy 15
Genitourinary allergy 16
Geographic tongue 16
Glycerin jelly 31
Glue fish 44
Goosefoot 25
Grasses 23 38

H

Hansel stain 13
Hay fever 12
Hay fever X 27
Headache 14
Heart disease congenital 19
Helminthosporium 29 37
Hemp 27 88
History form 53 56
History taking 53
Hors odendrum 23 37
Horse

dander 39
serum 41

House dust 30 83 86

Humidity 51

Hyperhidrosis 11

Hyposensitization 83 99

dosage 89
extract preparation 86 87
how long continued 92
precautions 89
reactions 89
schedule 89
slow response to 94

I

Infancy asthma in 71
Infection 10 49 79
Inhalants 21 41 61 82
avoidance 82
epithelial 59

important 22 23 27
irritants 49 51
molds 28 37
non seasonal 36 41
pollen 21 28 33 38
seasonal 21 30
skin testing 53 62

Insect allergy 40 48
Insecticides 40 41
Intracutaneous test 58
Iodides 77
Irritants inhalant 49 51

J

Jelly glycerin 31

K

Kochia scoparia 23

L

Lamb's quarters 23
Laryngeal stridor 19
Loeffler's syndrome 20

M

Marihuana 2 38
Meat base formula 14
Meat free diet 104
Microscratcher Morrison 59 60
Migraine 14
Milk 16 23 45 99
substitutes 74 99
Molds 28 30 37
Monilia sitophila 29
Morphine danger of 78
Mother of asthmatic child 43 81
93
Mountain cedar 26
Muscular pain 17

N

Nasal
allergy 19
cosmophilia 13

examination 12

obstruction 20

sneez 13

Nervous system 11

O

Oak 26 38

Orange 103

Orris root 10

Oxygen 79

P

Pallor allergic 17

Pancreas fibrocystic disease 19

Paronychia 1, 81 93

Penicillin 46 47 81

Perspiration excessive 17

Pigweeds 26

Physical allergy 31

Physical examination 8

Plantain 26

Pneumonia 19

Pollen 21 28 31 38

Pollen shelter 30 32

Prednisone 80

Problem cases 93 98

Psychic factors 1, 32 93

Pyrethrum 10

R

Rabbit hair 39

Ragweed 24 38

Reactions to treatment 89

Rug pads 39

Russian thistle 23 38

S

Sage 23 38

Scratch test 58

Sedatives 78

Serum horse 48

Sighing dyspnea 20

Silk 40

Skin allergy 13

Skin tests 53 62

form 57

intracutaneous 58

passive transfer 58

scratch 58

Smoke tobacco 40

Spondyloclidum 29 37

Spores mold 28 37

Status asthmaticus 79

Stridor laryngeal 19

Sweating excessive 17

Systemic allergy 11 34

T

Tension allergic 14

Thermal factors 10 51

Thymus 19

Tobacco 40

Tomato 103

Tongue geographic 16

Trees 26

U

Urinary manifestations 16

Urticaria 14

V

Vomiting 7 14 15 16 78

Vulva irritation 16

W

Weeds 24 28

Western water hemp 26

Wheat 102

Wormwood 23

Y

Yeast 29

